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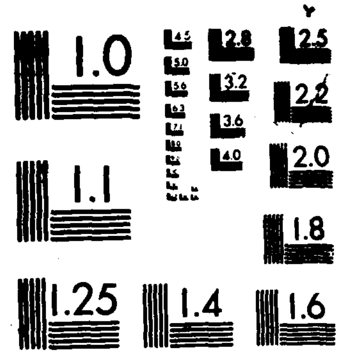

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A PROPOSED OPERATIONAL CONCEPT FOR THE DEFENSE COMMUNICATIONS OPERATIONS SUPPORT SYSTEM

by

William H. Gilbert

Alexander D. Schramm

A project submitted to the

Telecommunications Program of the

University of Colorado in partial fulfilment

of the requirements for the degree of

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A Proposed Operational Concept for the Defense
Communications Operation Support System

Project directed by Professor Frank S. Barnes

The Defense Communications Operations Support System (DCOSS) is the vehicle for achieving the objectives of the Integrated Defense Communications System Control Program. As such, the DCOSS is the means by which assests within the Defense Communications System will be managed in the future.

Since the Defense Communications System is changing so dramatically over the course of the next few years, a new system for controlling assets is urgently required. The Defense Communications Operations Support System (DCOSS) was developed by the Defense Communications Agency to meet that need.

This project provides a description of the present DCS control heirarchy and design capabililities and presents changes that result from DCOSS implementation. Additionally, it integrates standard Department of Defense organizational policies and structures allowing traditional

roles and responsibilities of military support organizations to fall into their normal positions of management.

This document does not reflect the position of the Department of Defense (DOD) or any of the United States Government Agencies or contractors with respect to the DCOSS. Additionally, this document should not be used as reference for DCOSS design and implementation.

This project for the Master of Science degree by

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CHAPTER I

INTRODUCTION

This project was undertaken to develop a preliminary operational concept for the Defense Communications Operations Support System (DCOSS) and conforms to the format of U. S. Air Force Regulation 57-1, "Operational Requirements - Statement of Operational Need (SON)." This document presents a summary of our proposed configuration and employment of the DCOSS. In particular, it provides preliminary guidance for the operations and use of shared and dedicated resources of the Defense Communications System (DCS) under DCOSS control.

The Total DCS Operations Plan (TDOP) is being developed by DCA to provide a standard framework for planning the evolution and improvement of DCS services. The TDOP accomplishes it's objectives by integrating operations and maximizing the use of computer technology. This approach is based on the methodology used by the pre-divesture Bell System in their Total Network Operations Plan (TNOP). As indicated in Figure 1-1, this document is subordinate to the TDOP. Additionally, other operations concepts, if required, will be subordinate to the DCOSS Operations Concept (e.g., DPAS, TRAMCON, SRCF).

An operations concept provides a functional overview of how a system will be implementated and functionally

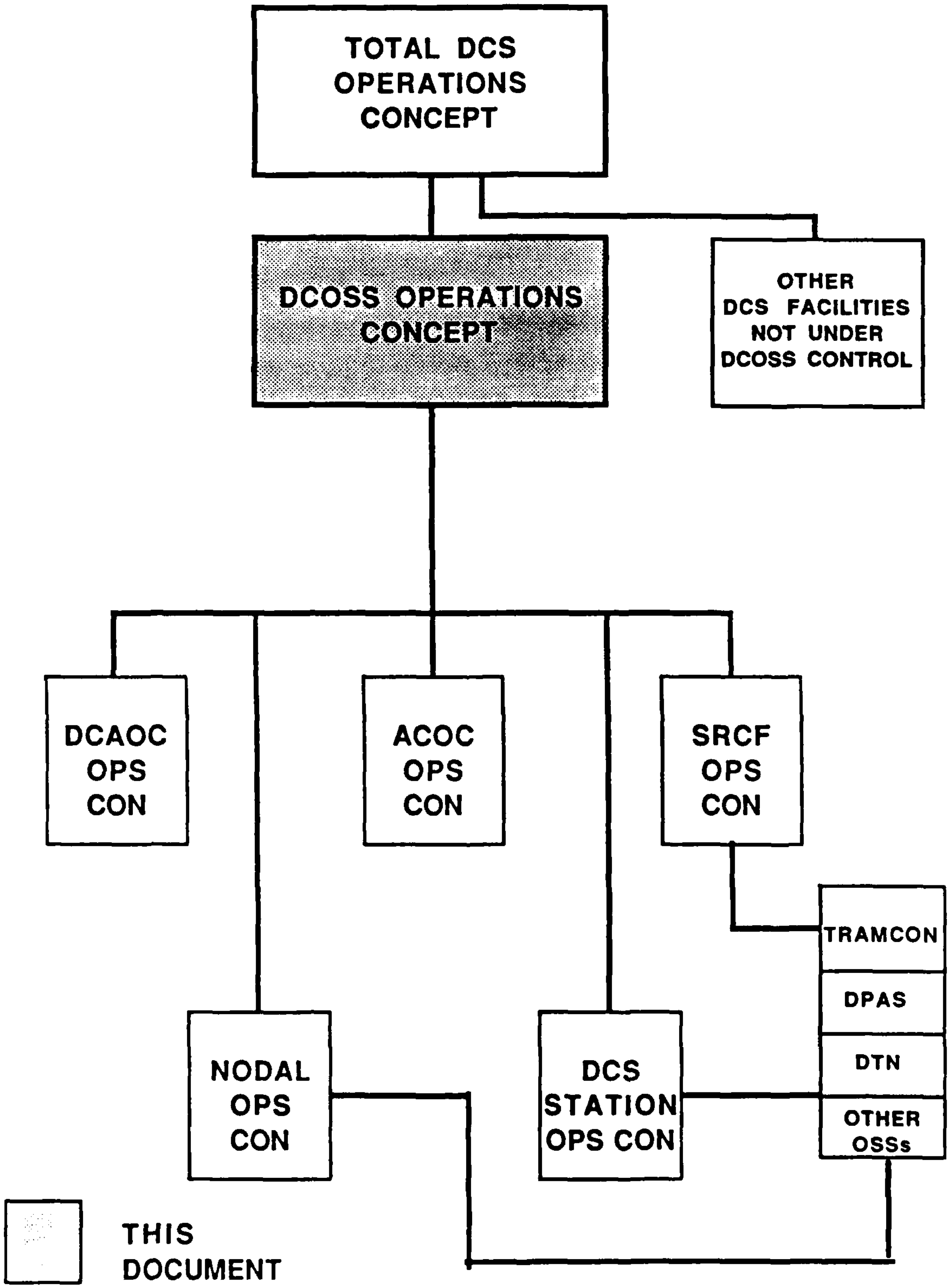

FIGURE 1-1
DCS OPERATIONS CONCEPT HEIRARCHY

deployed. This document resides in the development flow of the DCOSS as *indicated in Figure 1-2*. Updates to this concept will be required once development begins on the functional requirements documents that will serve as primary documents for developing lower level specifications.

This chapter provides a brief description of the DCS as it exists today and establishes the need to implement a new control structure.

1.1 Defense Communications Systems (DCS)

This section provides a brief look at the DCS mission and how the control structure exists today.

1.1.1 Defense Communications System (DCS) Description

The DCS is a composite of Department of Defense owned and leased telecommunications subsystems and networks that provide *long-haul, point-to-point (dedicated) and* switched communications services throughout the world. The elements of the DCS can be divided into three categories: transmission, switching, and control. These elements are supported by a wide range of subsystems as indicated below.

1.1.1.1 Transmission

a. Satellite communications.

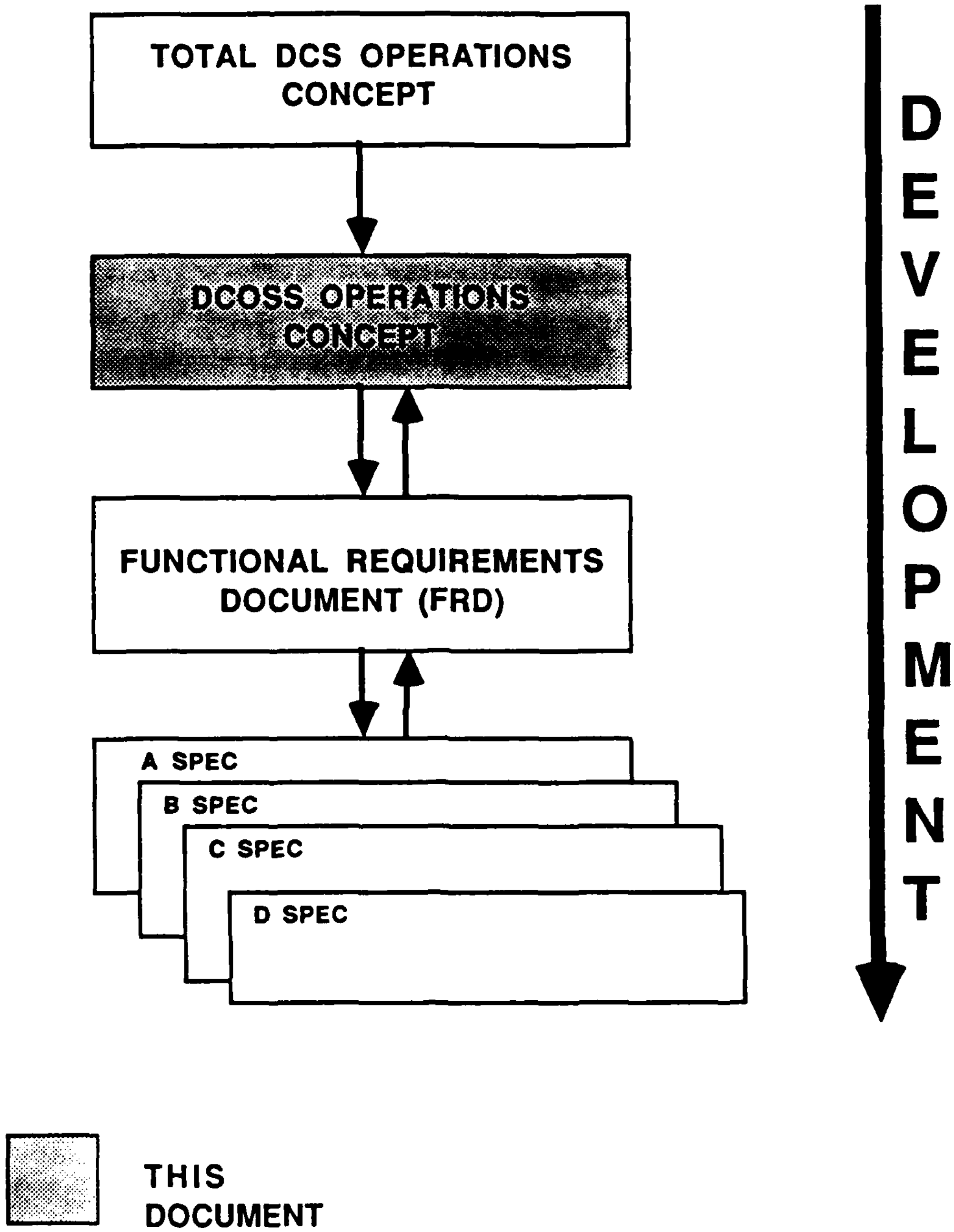

FIGURE 1-2
SYSTEM DEVELOPMENT FLOW

b. Line-of-site microwave and troposcatter radio systems.

c. Long-haul metallic cable and fiber optic cable facilities, both inland and underseas.

1.1.1.2 Switching

a. A Digital Switched Network (DSN) made up of digital end-office, stand-alone and multifunction switches, providing command and control and common user telephone services.

b. A voice network providing long-haul command and control and common user analog telephone services.

c. A packet-switched network providing services to data subscribers.

d. A message-switched network providing record copy to subscribers.

1.1.1.3 Control

Operations centers worldwide performing control functions supported by computer based support systems that provide near real-time resource management and control in peacetime and wartime.

1.1.2 Mission

The purpose of the Defense Communications System (DCS)

is to provide network telecommunications needed to satisfy the communications requirements of the Department of Defense and other authorized government agencies. This is accomplished using the control hierarchy described below.

1.1.3 DCS Control Hierarchy

The current control system is outlined in Figure 1-3. As indicated, the control system operates in five (5) levels. The first two (2) levels are operated and staffed by Defense Communications Agency personnel while the remaining three levels are operated and staffed by the individual military departments (Army, Air Force, or Navy).

Worldwide control (Level 1) is exercised at the Defense Communications Agency Operations Center (DCAOC) located at DCA Headquarters in Washington, D.C. Actions taken at this level are focused on DCS status and operations from a worldwide span of facilities. Theater control (Level 2) is exercised by two (2) Area Communications Operations Centers (ACOCs), one center located in the Pacific and the other in the Atlantic region. The ACOCs process data to and from the Sub-Region Control Facilities (SRCFs) (Level 3).

The SRCFs exercise control over major Technical Control Facilities and intermediate switching centers (Level 4). At the lowest level (Level 5), control is exercised over a specific facility designed to meet a particular

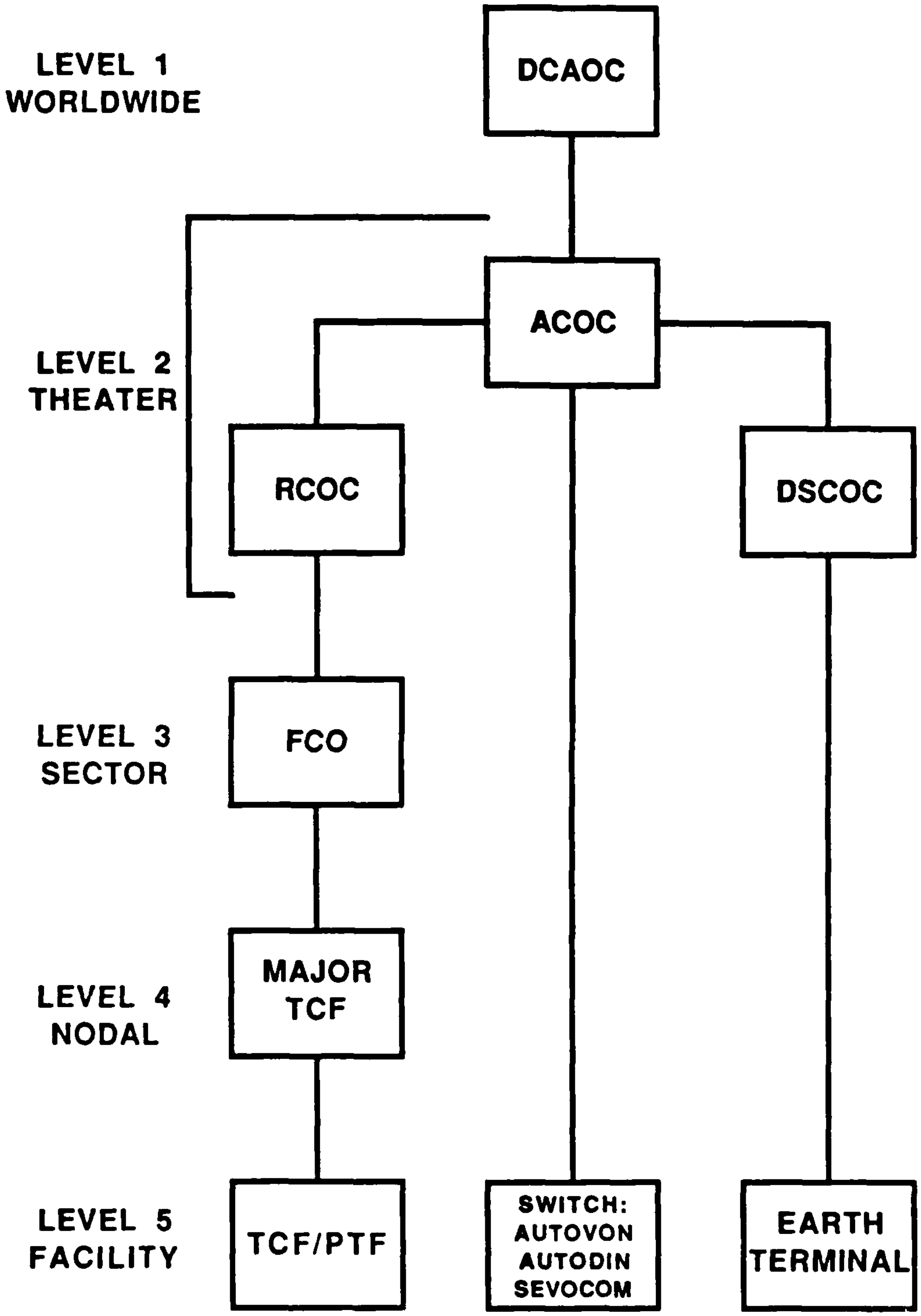

FIGURE 1-3
DCS CONTROL HEIRARCHY

communications requirement.

The existing control structure is highly dependent on human intervention. Automation at each level and within levels consists of hardware and software resources that cannot communicate with each other unless an operator acts as an interface between the various equipments and software programs. The following looks at the present system in terms of responsiveness, interoperability, and survivability.

1.2.1 Responsiveness

Responsiveness is the ability of a system or subsystem to respond to a change. This change can take the form of operator commands or a set of predetermined stimulus to activate changes (automatic events). Within the control hierarchy, changes can come from either the same level, a higher level, or a lower level.

The present control system is limited since it relies heavily on manual methods. Voice coordination is often required among operations personnel. Teletype messages are often used to provide the required coordination among operating locations. Additionally, the present system consists of non-interoperable subsystems which require time to correlate data between independent data bases. Due to manual processing and diverse communications elements,

the present system is slow and non-responsive to real-time direction.

1.2.2 Interoperability

The capability of a control center to perform a function, operation, or mission normally assigned to another control center is defined as interoperability. Standardization of equipment and policies is an important element of interoperability.

As it exists today, the present control system is made up of subsystems that were designed and deployed without regard to other subsystems under it's control. Equipment is non-standard within each level and at different levels of the control system. Computers cannot communicate and operations personnel require training on diverse systems installed at each location. The logistics of operating and maintaining the present system is extremely difficult considering the different types of equipment and extensive operator training required at each location. Not to mention equipment that is being installed today that might not co-exist with the present system. In the present system, standards have not been established and adhered to. As a result, control centers in the hierarchy cannot assume the functions of another center. This leads to the next discussion of survivability.

1.2.3 Survivability

Survivability is a relative concept directly related to the threat and the mission of a system. Within the confines of this document, the level of DCS survivability is not discussed; however, survivability can be discussed in terms of the ability to communicate and interoperate.

As discussed previously, control centers are not capable of assuming the responsibilities of another center in the event of a control center loss. For example, the loss of the Defense Communications Agency Operating Center would severely limit the ability of the Area Operations Centers to provide worldwide control and status. Similarly, the Regional Operations Centers could not provide theater-wide control and status in the event of the loss of an Area Operations Center.

Additionally, the present control system uses dedicated communications links that have limited alternate routing capability. Centers are unable to communicate in event of communications equipment or link failures.

Both factors stated above serverely limit the mission of the present control system under threat conditions. An adequate margin of safety has not been designed into the present system.

1.3 Summary

Control and management of the Defense Communications System is limited under the present control structure. The loss of a center poses a threat to overall mission effectiveness. Non-standard equipment and operations prevent the goals of interoperability and standardization. Response time is wasted performing operator tasks allowing centers to communicate with each other. Training of personnel is difficult due to the different types of equipment and procedures required at each operating center. Supply resources are strained to support all the additional equipment required to interface subsystems.

With these factors in mind, the following operational concept addresses improvements in the Defense Communicatons System control hierarchy currently planned under the Defense Communications Operations Support System. Responsiveness, interoperability/standardization, and survivability of the new control system is of paramount concern in the development process.

CHAPTER II

MISSION TASK

2.0 Defense Communications Agency Mission Statement

In accordance with DCA circular 310-70-1, the mission of DCA is to perform system engineering for the Defense Communications System (DCS). DCA must ensure that the DCS is planned, improved, operated, maintained and managed effectively, efficiently and economically, to meet the requirements of the National Command Authorities (NCA), the Department of Defense, and other government agencies.

2.1 DCOSS Mission Statement

The DCS is the general purpose, US Government Telecommunications System managed and used by the DOD and other Government Agencies. The Defense Communications Operations Support System (DCOSS) will be the means within the DCS for ensuring efficient use of communications assets on a day to day basis, maintaining critical user connectivity through all levels of stress.

2.1.1 DCOSS Development Objectives

DCOSS Development will meet the design criterion discussed in the following paragraphs.

2.1.1.1 Evolutionary

Improvement in systems control through use of DCOSS will be evolutionary. They will exploit technical advances and procedural refinements based on new technology, standardization, training methods, and field experiences.

2.1.1.2 Survivability

The DCOSS control system will be designed for maximum survivability. Factors taken into consideration should include communication links, single node failures, and other Operation Support Systems presently in use or in the planning stage.

2.1.1.3 Flexibility

The control system will be flexible enough to permit interface and connection to contingency systems extending the DCS. Additionally, the control system will be designed to permit future growth.

2.1.1.4 Standardization

The control system will be designed to permit the use of equipmemt common to all centers. Operating procedures, training methods, and manning criteria will be developed in accordance with standard policies.

2.1.1.5 Cost Effectiveness

The DCOSS will be developed, engineered, maintained and operated at the lowest cost consistent with operational effectiveness.

CHAPTER III

DCOSS Control Environment and Operational Scope of Communications

3.0 Introduction

This chapter discusses the Defense Communications Operations Support System (DCOSS) control environment under normal and threat conditions. Although it is impractical to cover all possible situations, the following analysis does focus on a set of possible threats and offers some design and operational objectives that should be considered during DCOSS development.

The remainder of this chapter will describe the DCOSS operational scope of communications, design features, and system constraints.

3.1 Operational Environment

The DCOSS operational environment encompasses all external and internal circumstances, objectives, and conditions that influence DCS operations. Changes in operational configurations and the effects of natural/man-made threats may have an adverse impact on DCOSS operations. Although plans may be developed to lessen the impact of these external threats on DCOSS

mission objectives, the results of such actions are usually assessed after the threat has occurred.

Configuration changes include the incorporation of new control elements, the reconfiguration of existing elements, the addition of new capabilities applied to existing resources, and the relocation of existing resources. These changes should remain, when feasible, under Configuration Control Board actions to prevent adverse impacts on DCOSS objectives.

3.1.1 Normal Environment

In a normal, benign environment the Defense Communications System (DCS) consists of systems which perform functions that can be divided into the following broad functional areas:

(a) System Engineering

(b) System Management

(c) System Operations

The DCS, being a service that provides for end-to-end user connectivity, uses system control measures to manage and operate the DCS on a day-to-day basis. System control is defined as the function that, "ensures (that) user-to-user service is maintained on a near-term basis

under changing traffic conditions, user requirements, natural or man-made stresses, disturbances, and equipment disruptions." (DCA Circular, 310-70-1, Vol 1, p. 2-1). The following look at system control will provide some insight on how the normal operating environment is structured.

System control takes into consideration the following interrelated subfunctions:

(a) Facility surveillance provides real-time equipment, transmission, and network terminal trend data concerning the status of DCS facilities, and their near-term performance over a period of time. It also provides data to support long range (beyond 5 years) system design objectives.

(b) Traffic surveillance provides real-time data concerning systems and network loading, data processing queue status, message backlog, and other measures that describe system, network, and facility congestion and traffic load.

(c) Network control provides real-time and near-term control of switched or special networks and

associated transmission equipment and resource allocation.

(d) Traffic control provides real-time and near-term control of traffic flow and routing, such as code blocking, code cancellation, alternate route cancellation, and user prioritization.

(e) Technical Control provides the real-time transmission system configuration, quality assurance, quality control, and reporting functions necessary for effective maintenance/operations of transmission paths and facilities.

(f) Satellite communications control consists of:

(1) Satellite control. The positioning and housekeeping of DSCS satellites.

(2) Satellite network control. The control of user's access to the satellite network.

(3) Communications payload control. Those functions that control and configure the DSCS communications payload on the DSCS III satellite.

(4) Electronic Counter-Countermeasures (ECCM) network control including functions that involve network link establishment, monitoring, anomaly analysis, stress determination, and network configuration.

(5) Ground Mobile Forces (GMF) control including functions that involve allocation of power and bandwidth on DSCS satellites for use by GMF terminals.

As discussed above, system control encompasses numerous functions and subfunctions. The DCOSS, being the means of supporting DCS real-time control and monitoring, must be designed and implemented with significant emphasis placed on system control objectives as spelled out in DCA Circular 310-70-1.

Under normal conditions, the DCOSS supports the system control functions listed above. In addition, the same system control functions support the DCS under threat conditions as discussed below.

3.1.2 Threat Environment

The DCOSS operational environment may experience threats from four general areas: natural, accidental, deliberate (man-made) passive attacks, and deliberate (man-made) active attacks. These threats may impair the DCOSS mission through denial of service, unauthorized disclosure, unauthorized modifications, or other areas of service and may expose DCOSS operations to environments which are not conducive to normal operations. A brief discussion of each threat follows.

3.1.2.1 Natural Threats

Natural threats occur independently of any level of conflict. The concern with natural threats focuses on the changes induced in the physical operating environment that might cause the interruption of communications operations. The present of highly sensitive technical equipment, fragile system components, and diverse power sources increase the DCOSS susceptibility to natural threats. Natural threats can include earthquakes, hurricanes, atmospheric weather phenomena, seasonal weather conditions, solar phenomena, biological phenomena, and other natural threats.

The uncertainty associated with the time and place of a

natural threat occurrence compounds the complexity of accessing DCOSS vulnerabilities. If the DCOSS is weakened or disabled by natural threats, the system could be more susceptible to accidental or deliberate threats.

3.1.2.2 Accidental Threats:

The DCOSS may be susceptible to damage from several types of accidental occurrences. These threats are not premeditated or target-directed and may occur at any level of conflict. Accidents may vary in severity and impact and can cause disruptions of service and cause damage to DCOSS supporting equipment and personnel. Accidental threats can be caused by aircraft, automobile, gas leaks, chemical spills, forest fires, floods, explosions, and other accidental causes.

Accidental occurrences may also cause an unauthorized disclosure of classified informations. These disclosures may result from:

(a) user errors,

(b) operator errors,

(c) data preparation errors,

(d) output errors,

(e) system errors, and

(f) communications errors.

3.1.2.3 Deliberate (Man-made) Passive Threats

Passive attacks to the DCOSS include analysis of electromagnetic emanations, wiretapping, and exposure or release of sensitive or classified information to unauthorized users. Each threat attempt has an objective and targets specific objective. The DCOSS is especially susceptible to these attacks due to the large complexity of equipment (e.g., cables, land lines, microwave links, satellite linds, and computers).

3.1.2.4 Deliberate (Man-made) Active Threats:

Deliberate active threats pose a serious threat to any communications system. These threats can disrupt communications operations to the extent that they deny communications services to authorized users. Unauthorized access, unauthorized modifications, sabotage, or direct physical attack are examples of deliberate active threats.

The threats and the probability of threat scenario execution depend on compounded probabilities of threat variables including level of conflict, whether the target has a CONUS or an overseas location, and the physical environment.

3.2 DCOSS Threat Response

Although the direct response to threat conditions depends on numerous factors, the DCOSS response can be stated in terms of the following objectives. The primary objectives as outlined in DCA Circular 310-70-1 are:

(a) Maintain critical subscriber and system connectivity without excessive use of available system or network mission capacity.

(b) Incorporate a level of control and system management survivability consistent with the survivability of the users.

(c) React quickly and flexibly to assure sustained quality user service through timely and effective monitoring, analysis, and control execution in both normal and stressed environments.

(d) Interoperate with control centers associated with other communications systems to allow maximum flexibility in restoring user service.

(e) Maximate system efficiency through effective control action.

(f) Assist in the efficient use of limited operation and maintenance manpower at DCS stations.

(g) Minimize manpower resources required for control of DCS assets.

3.3 Summary

The DCOSS operations control environment consists of normal operations and operations under threat conditions. DCOSS response to threat conditions or new configurations required of the DCS must be timely and efficient. The system control design must support the objectives listed in paragraph 3.2.

To insure timely response, system control must be exercised at the lowest level consistent with authority and resources. Therefore, the DCOSS control centers must be capable of performing functions to lessen to impact of unanticipated events such as natural or accidental disturbances while maintaining support to important national objectives.

3.4 Operational Scope of Communications

The DCOSS objective is to support the Defense Communications System mission requirements. Operational and functional requirements of facilities in the control hierarchy differ from facility to facility. For example, status and control signals from satellite terminals are not

the same as status and control signals from patch and test facilities. Therefore, the DCOSS must be capable of accepting varying degrees of communications inputs, protocols, and formats. The following features should be considered during DCOSS development:

(a) Modernized, modular architectures to achieve flexibility and maintainability while maintaining growth potential;

(b) automated functions to reduce errors, increase operator efficiency, and lower manpower requirements;

(c) equipment redundancy and dynamic reconfiguration of communications resources;

(d) survivable command and control resources by designing interoperable control centers, using alternate routing of communications paths, and by eliminating single-point failure elements;

(e) centralized control/monitoring and maintenance;

(f) substantial communications growth capabilities through system sizing, modularization, and space allocation;

(g) interoperable subsystems, through standardization of hardware and software, procedural commonality, and common contingency plans;

(h) minimal life cycle costs by maximizing equipment reliability and minimizing manpower requirements;

(i) communications privacy and security without inpending the flow of data; and

(j) centralized control of resources with the capability for rapid, systematic, centralized fault isolation and troubleshooting.

3.4.1 System Contraints

Operational limitations, i.e., contraints, affect the ability of the DCOSS to provide services required to meet DCS mission requirements. These contraints fall into the following categories:

(a) inherent circuit/link contraints which limit the data rate, channel capacity, and bandwidth requirements that the DCOSS supports;

(b) configuration constraints such as those which require the physical separation of RED/BLACK equipment;

(c) availability constraints that limit the number of DCOSS resources able to support increased network loading by new or expanded programs;

(d) real time contraints that limit the number of selectable alternatives in response to an outage during threat conditions; and

(e) communications constraints within different countries and geographic locations concerning types of transmission and facilities allowed.

CHAPTER IV

WORLDWIDE CONTROL ARCHITECTURE

4.0 Introduction

This chapter discusses the Defense Communications System control architecture as implemented under the Defense Communications Agency Operations Support System (DCOSS). Control and management is implemented through a five (5) level heirarchy. See Figure 4-1. Control direction is implemented at individual levels of the heirarchy through facilities referred to as "operations centers." An "operations center" is a group of personnel, supported by required automatic data processing equipment (ADPE), and communications resources under authority of a single individual.

The first part of this chapter provides an overview of the DCS control hierarchy. The remainder focuses on a detailed discussion of the Defense Communications Agency Operations Center (DCAOC) at Level 1.

4.1 Control Hierarchy Overview

At Level 1, the Defense Communications Agency

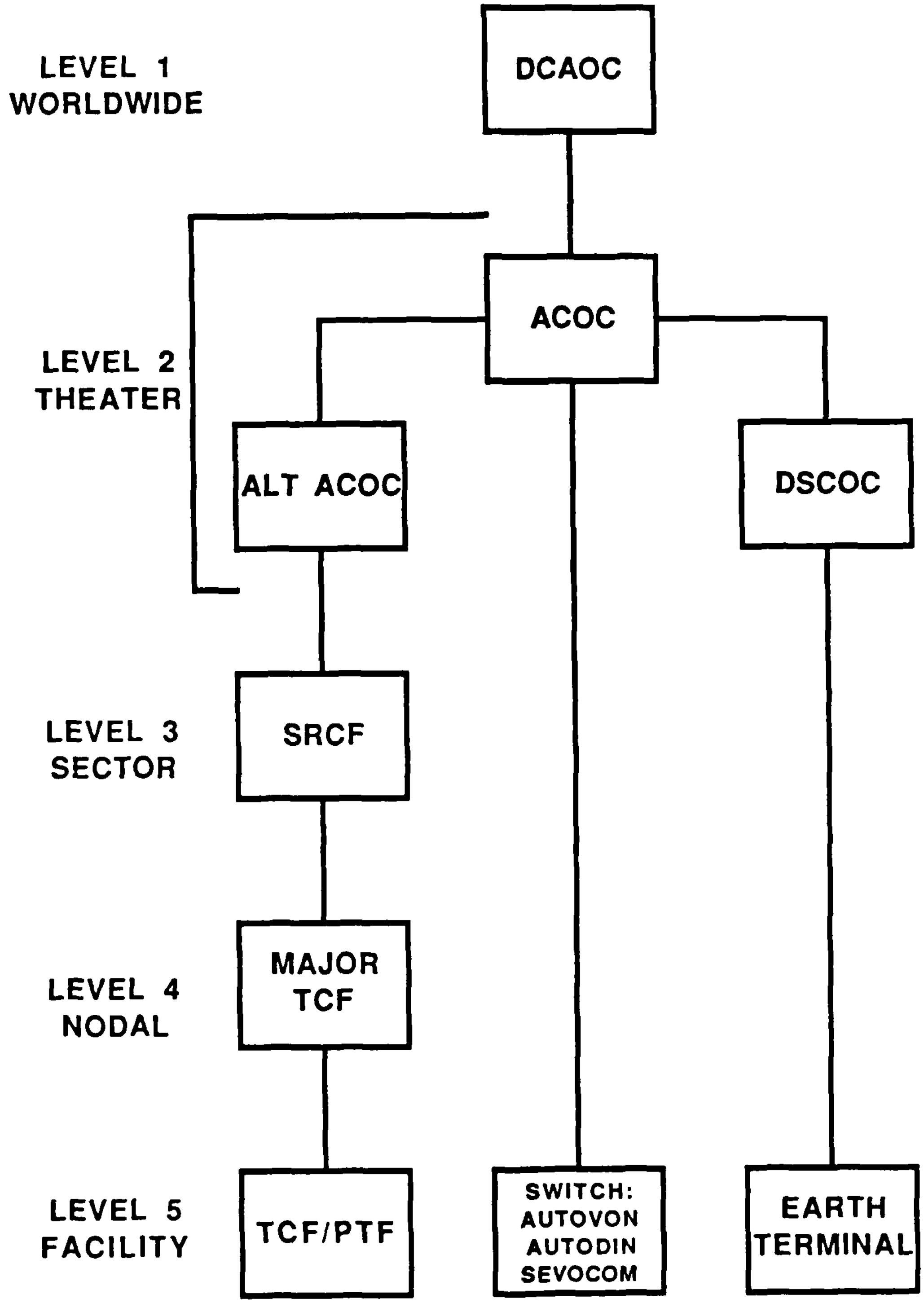

FIGURE 4-1
DCS CONTROL HEIRARCHY

Operations Center (DCAOC) exercises worldwide operational direction over all elements of the Defense Communications System (DCS). The objective of this direction is to ensure maximum performance of the DCS in an extremely dynamic environment as well as during and after any natural or man-made disruptions.

The DCAOC discharges this responsibility through worldwide system status monitoring, performance reporting, contingency planning, circuit rerouting, and restoral actions. To ensure effective operational direction of DCS elements outside the continental United States (OCONUS) at the theater level, Area Communications Operations Centers were developed.

The Area Communications Operations Center (ACOC) exercises control responsibilities (Level 2) within it's particular theater. There are two ACOCs: one for the Pacific Theater located in Oahu, Hawaii, and one for the Atlantic Theater located in Vaihingen, Germany. The ACOC serves as the theater focal point for providing status, monitoring, and performance data to the DCAOC and other centers for communications trend analysis. In case of failure, each ACOC has an alternate ACOC (AACOC) that can assume theater responsibilities in the event the ACOC is

unavailable. The ACOC exercises authority over and gathers data from the Sub-Region Control Facilities (SRCFs).

At Level 3, the SRCFs exercise control and perform data gathering from DCS facilities within a geographic region. The SRCF is the first level at which the individual military departments (Army, Navy, or Air Force) operate and maintain DCS facilities. Information at this level is obtained from major Technical Control Facilities (TCFs).

The major TCF or nodal facility (Level 4) conducts operations and maintenance activities such as fault isolation, repair and restoral actions, preventive maintenance, equipment installation, and records maintenance. Major TCFs perform all the duties of a TCF and, additionally, perform control and data gathering from TCFs and other facilities under their control.

The station or facility level (Level 5) is the lowest level of control and is peculiar to a specific facility; thus its control activities are focused on local equipment using provisions built into the particular communication subsystem design. Activities at this level include, e.g., equipment and channel quality control, equipment substitution and restoral, fault isolation, preventive and

corrective maintenance, and rerouting of circuits or groups of circuits.

4.2 Defense Communications Agency Operations Center (DCAOC)

This section describes the DCAOC in terms of the following areas:

a. Functions/Responsibilities

b. Management and Control Systems

c. DCOSS - Worldwide On-line System Relationship

d. Functional Interfaces

4.2.1 Functions/Responsibilities

The DCAOC exercises worldwide operational control over all elements of the DCS through the Defense Communications Agency Operations Control Complex (DOCC). Major DCAOC functions, as detailed in the Management Engineering Plant for the Integrated DCS System Control Program (Draft, June 20, 1986) include the following:

a. Maintain the reported status of the DCS.

b. Provide worldwide system control of the DCS to ensure assets are used to maintain and restore maximum DCS performance.

c. Exercise operational direction over the elements of the DCS through the DCA ACOCs.

d. Provide to the National Military Command Center and designated federal agencies, upon request the lastest status of communications in areas of special interest.

e. Notify the Joint Chiefs of Staff (JCS); Manager, NCS; and other designated agencies, as appropriate, of possible communications disruptions that may have a significant impact on the DCS.

f. Prepare special reports on items of interest concerning degradations or threatening conditions within the DCS environment and distribute them to DCA staff elements as appropriate.

e. Provide the JCS, unified and specified commands,

military services, and others as designated, essential information on the gobal communications situations within the DCS by publishing the daily DCA Communications Status Report (COMSTAT) and Communications Spot Report (COMSPOT).

h. Participate in and/or support exercises involving the DCS.

i. Provide operational direction over the DCS operating elements within the DCS geographic areas to include implementing the DCAOC restoral plans and emergency allocation of DCS assets.

j. Provide the JCS, unified and specified commands, military services, and others as designated, with information concerning serious degradation of communications operations.

k. Provide technical advice on overall capabilities and operation of the DCS.

In summary, the DCAOC responsibilities include worldwide status monitoring, performance monitoring, contingency planning, circuit rerouting, and restorals of service. To

perform its assigned duties, the DCAOC uses systems described in the following sections.

4.2.2 Management and Control Systems

The Worldwide On-Line System (WWOLS) is currently operational at the DCAOC. WWOLS stores DCS information such as facility, circuit, trunk, and link data and statistical data for DCS reporting and quality control purposes. At the DCAOC, WWOLS provides batch processing and worldwide communications capabilities that supplement and support the DCOSS; however, no DCOSS equipment resides at the DCAOC. The interface between the DCOSS, that will be discussed in section 5.1.4, resides at the ACOC/NCF level. See Figure 4-2. The following section describes the WWOLS.

4.2.2.1 WWOLS

The WWOLS is a distributed processing system which consists of five (5) IBM 4331 processors at the Defense Communications Agency Operations Center, one (1) IBM 4341 system at the Defense Commercial Communications Office, and two (2) IBM 4331 systems at each of the European and

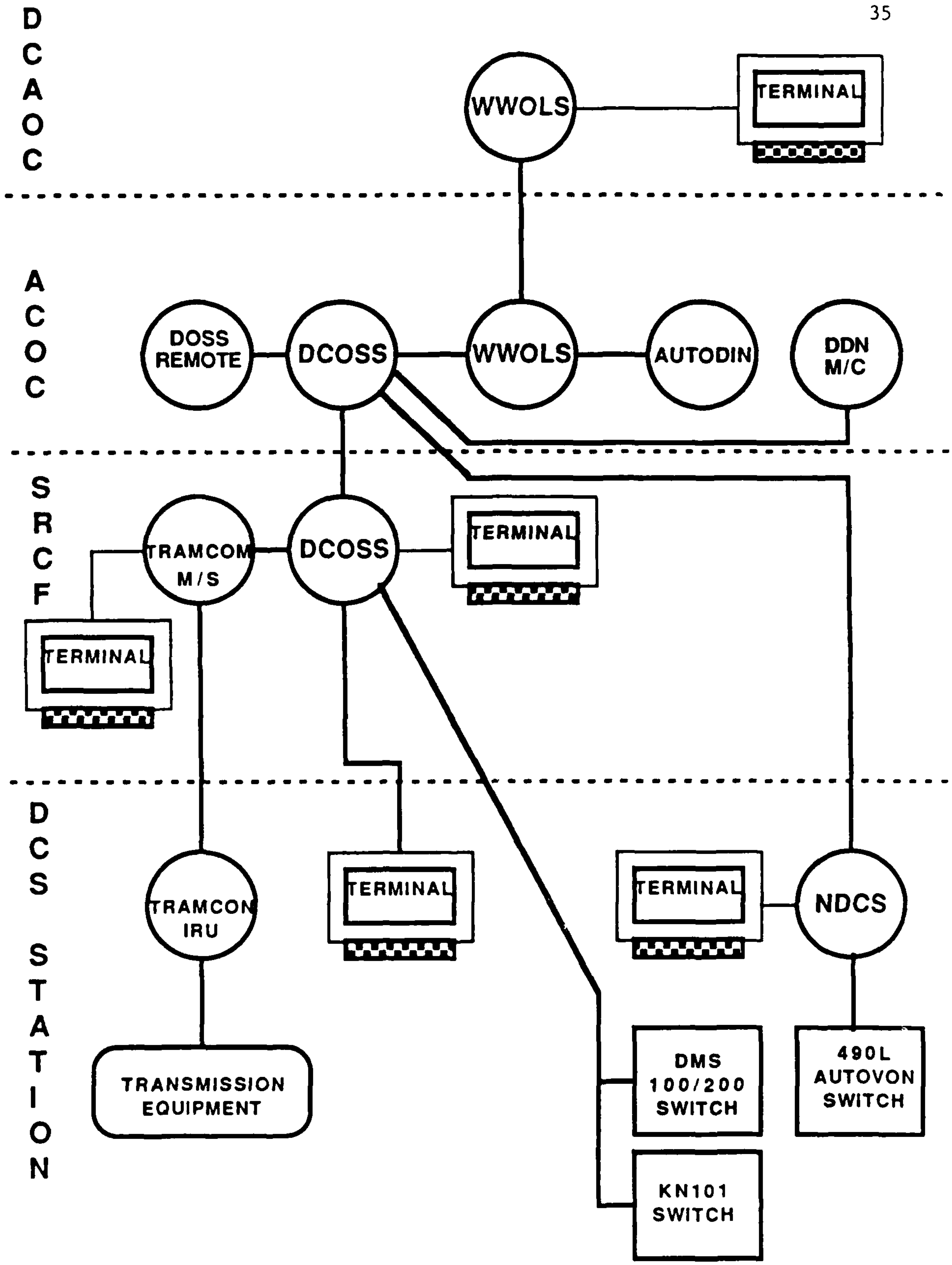

FIGURE 4-2
DCOSS ADPE STRUCTURE

Pacific Area Communications Operations Centers. These processors use the following data base management system (DBMS).

4.2.2.1.1 DBMS

The WWOLS Data Base Management System is named TOTAL. Total is divided into four major areas:

a. Facility/Circuit/Trunk/Link System: This subsystem contains DCS facility, link, trunk, circuit, data and network connectivity information. Files also have information on commercial circuit numbers, non-DCS circuits, station designators and site geographical information.

b. Statistical Data System/Performance Analysis Reporting System: This sub-system is sued for status reporting and quality control. Reports identify station, link, trunk, channel, circuit and equipment status in accordance with Defense Communications Agency Circular 310-55-1.

c. Management Index System: This subsystem contains AUTODIN data including circuit numbers, switch indentification, switch routing, switch/channel and traffic information. Data from this system is used for report generation for traffic data analysis and network engineering studies.

d. Voice Information System: This subsystem contains data related to AUTOVON, and is comprised of six small componenets or subsections. These include: overseas AUTOVON, CONUS AUTOVON, Master Subscriber List, Telephone Directory, Memory load and Mnemonic Files.

4.2.2.1.2 WWOLS Applications Programs

WWOLS programs perform the following functions:

a. Data Entry: The Data Entry System is one method of entering data into the WWOLS. For example, a Telecommunication Service Request can be entered into the WWOLS via teletypewriter, punched card or CRT keyboard. This program is also used to change data records already resident in the WWOLS data

base and to update batch files used in data bases at remote locations.

b. Computer Assisted Circuit Engineering and Allocation System: This program is used to retrieve the Telecommunication Service Request data from the Data Entry System for display to the allocation engineer who compares the service requested with the available government-owned services. After correlating all data and determining service requirements can be met, the allocation engineer uses this sytem to reserve the communication channels for curcuit connectivity.

c. WWOLS Data Base Query Program: This program is coded so that each query contains a three character code indentifier followed by the appropriate parameter(s). The user specifies the parameters according to the information he requires. Outputs include listings of data on circuits, trunks, links, and station.

d. Telecommunication Service Order Processor: This program converts a Telecommunication Service Request into a Telecommunication Service Order.

The processor accepts data from an input device (e.g., VDT) for entry into the WWOLS data fiels and performs format and character validation. Upon completion of all entries, the processor generates AUTOVON messages for distribution to all concerned users and updates the WWOLS files.

e. File Maintenance System: This program adds, deletes, and updates all data base records within WWOLS. One of its subprograms adds, deletes, and updates circuit, trunk, link, geographic location, station designator, and routing information. In addition, other DBMS subsystems within this system transmit data to other centers and perform accounting procedures.

f. Information Retrieval System: This system is used by personnel at remote sites to retrieve circuit, trunk, link, facility and other information from the WWOLS data base. Access is generally made from input terminals via the AUTODIN network.

g. ROUTER System: ROUTER is a system engineering tool developed by the Defense Communications Engineering Center and is used to send complete

sets of circuit requirements for connectivity in establishing DCS network architecture.

4.2.2.1.3 Summary

The WWOLS data acquisition job is a basic order/inventory system. Traffic measurement and call detail requests represent the orders. Traffic data previously collected represents the inventory. Traffic measurement requests are entered into the WWOLS data base which shares information with other reporting systems. This shared information is necessary to ensure the correct association between recorded traffic/call data and the switching elements being measured. This data base runs as a batch system and is updated periodically to reflect changes in the physical arrangement of the switches. This ensures that data is treated consistently in each of the reporting processes.

4.2.3 DCOSS - WWOLS Relationship

The Worldwide On-Line System (WWOLS) is currently operational at DCA operating centers. The DCOSS and WWOLS

will share a common data base supporting the real-time control functions as well as the network administration functions. At present, the WWOLS at the DCAOC will receive DCOSS data from the WWOLS equipment located at the ACOC and AACOC (Level 2). The relationship between the ACOC (NCF-DCOSS) and AACOC (ALT NCF-DCOSS) will be discussed in Chapter V.

4.2.4 Functional Interfaces

The DCOSS provides real-time status and alarm reporting and will interface with WWOLS where the bulk processing and controller interface (integrated terminal display drivers) will reside. This ensures that DCOSS and WWOLS can share a common integrated data base supporting the real-time control functions.

The DCOSS-WWOLS interface will be physically located at the DCOSS control centers (ACOCs, AACOCs, and SRCFs) where WWOLS is currently accessible. The interface that will provide the real-time status and control required by the DCA Operations Center (DCAOC) will be between WWOLS subsystems. See Figure 4-3. This interface is presently in operation; however, it does not support the real-time

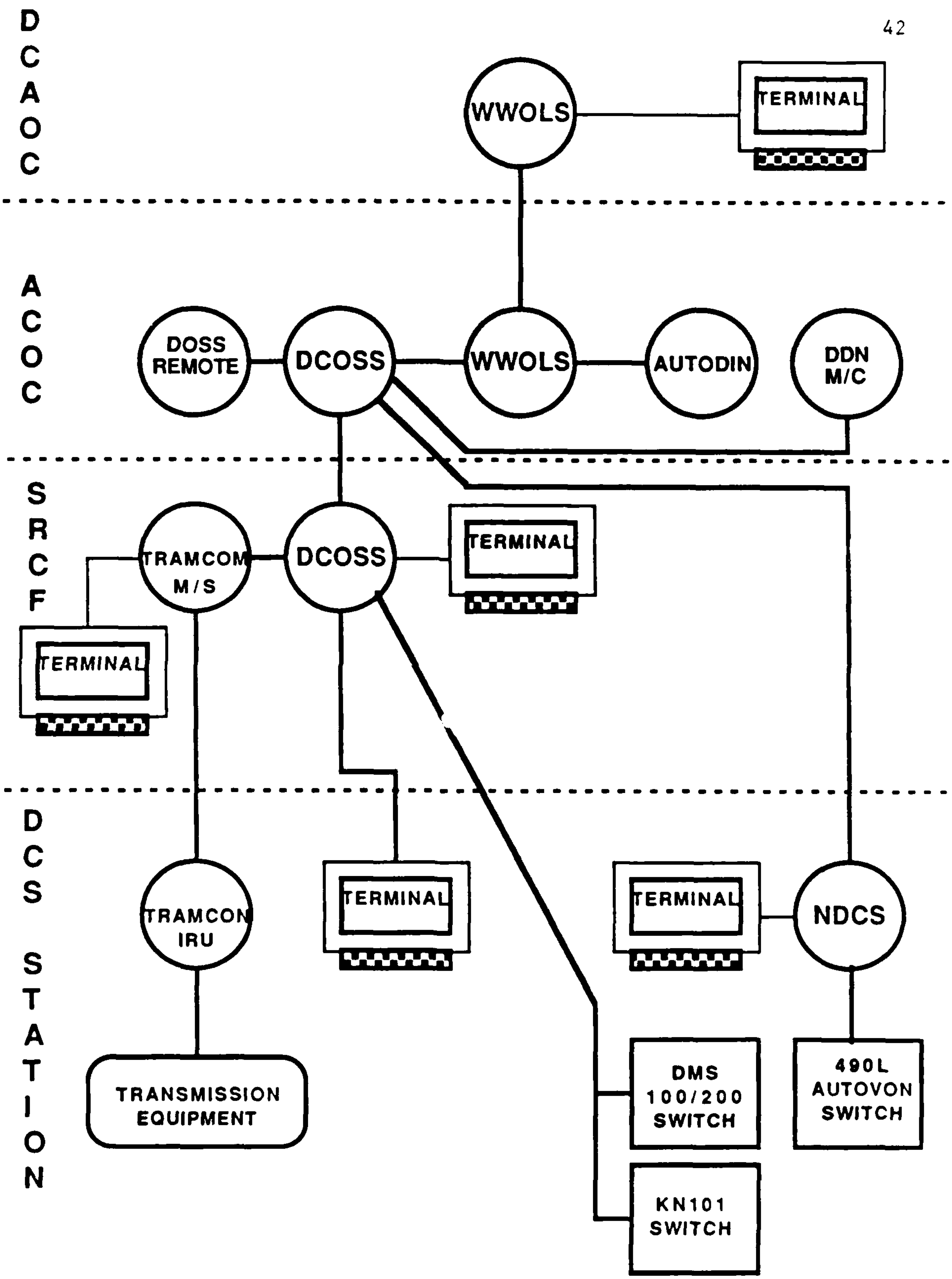

FIGURE 4-3
DCOSS ADPE STRUCTURE

functions available from DCOSS. The changes required in the WWOLS interface to support DCOSS data are currently being defined and are not considered in this report.

CHAPTER V

Area and Subregion Control Architecture

5.0 Introduction

Each communications subsystem such as the Automatic Digital Network, Automatic Voice Network, Defense Data Network and Defense Switched Network, performs a specific function in the Defense Communications System. The Automatic Digital Network (AUTODIN) is the present common-user, record communications network while the Automatic Voice Network (AUTOVON) is the present common-user voice communications network. The Defense Data Network (DDN) is a high speed, packet-switched, data transfer network and the Defense Switched Network (DSN) is a common-user switching and relay network consisting of multifunction switches, stand alone switches and end offices. All of these networks are used by the Department of Defense and other authorized U.S. government agencies.

The Defense Data Network is the replacement for AUTODIN and the Defense Switched Network is the replacement for AUTOVON. The Defense Communications Operations Support System (DCOSS) will provide an automated means by which these and other new elements of the Defense Communication

System (DCS) and DCS control will be integrated at and below the theater level.

This chapter addresses the theater and subregional control architecture of the DCS as implemented under DCOSS. The system is initially examined from the Area Communications Operations Center (ACOC) and Defense Satellite Communications (DSCS) Operations Support System (DOSS) perspective. Next, the Subregional Control Facility implementation of DCOSS is discussed. The overall framework for this examination will follow the outline below:

(a) Functions/Responsibilities.

(b) Equipment/Hardware/Software.

(c) System Criterion.

(d) Interfaces.

5.1 Area Communications Operations Center (ACOC)

As discussed previously, the ACOC is that facility within the DCS control hierarchy responsible for DCS operation and direction on a theater-wide basis. The two ACOCs are located at Oahu, Hawaii and Vaihingen, Germany.

The Oahu ACOC provides day-to-day direction of the DCS for the Pacific Theater while the Vaihingen ACOC does the same for the European Theater.

In addition to the ACOCs, each theater has one or more alternate ACOCs designated AACOCs. The AACOCs are responsible for assuming the duties of the primary ACOC in the event the primary facility is damaged or destroyed. The operational concept for the AACOCs may vary between theaters. A Pacific Theater AACOC may, for example, be responsible for a specific geographic region, while the European AACOC may routinely operate the entire theater for a portion of the day. The Pacific Theater AACOCs are also designated Regional Control Facilities (RCFs). These facilities are located at Yokota AB, Japan and Clark AB, Philippines. The European ACOC is located in Croughton, UK.

At the ACOC level, the DCOSS is the computer based system dedicated to real-time control of the DCS within the theater. The DCOSS will be integrated with WWOLS at the ACOC level to perform nonreal-time functions. Each system within the ACOC will be allocated those DCOSS resources necessary to accomplish effective control of its resource.

Individual control functions will be integrated through use of a common data base design, standardized interfaces, and stardard terminals. These terminals will be designated DCOSS Standard Terminals (DSTs) for all subsystems. See Figure 5-1. Each communications system that shares DCOSS will provide the software control required for its optimum operation within the DCS control hierarchy. Individual systems will access DCOSS equipment through use of the DST. Consequently, there will be software from many systems in operation on the DCOSS. All software will be properly integrated to ensure that limited resources of the ACOC computers are used most effectively.

The Network Data Control System (NDCS) will be the first system integrated into the DCOSS. The NDCS incorporates into the ACOC (or NCF) DCOSS computer AUTOVON management functions which were previously performed by separate pieces of equipment (i.e. the Network Control System, the Traffic Data Collection System, and the Centralized Alarm System). The functions of NDCS will run on DCOSS system software at the ACOC. NDCS specific hardware and software will be installed at the individual AUTOVON switches. Implementation of DCOSS will enable the controller at the ACOC to monitor the status of the various switches and remotely diagnose and issue control

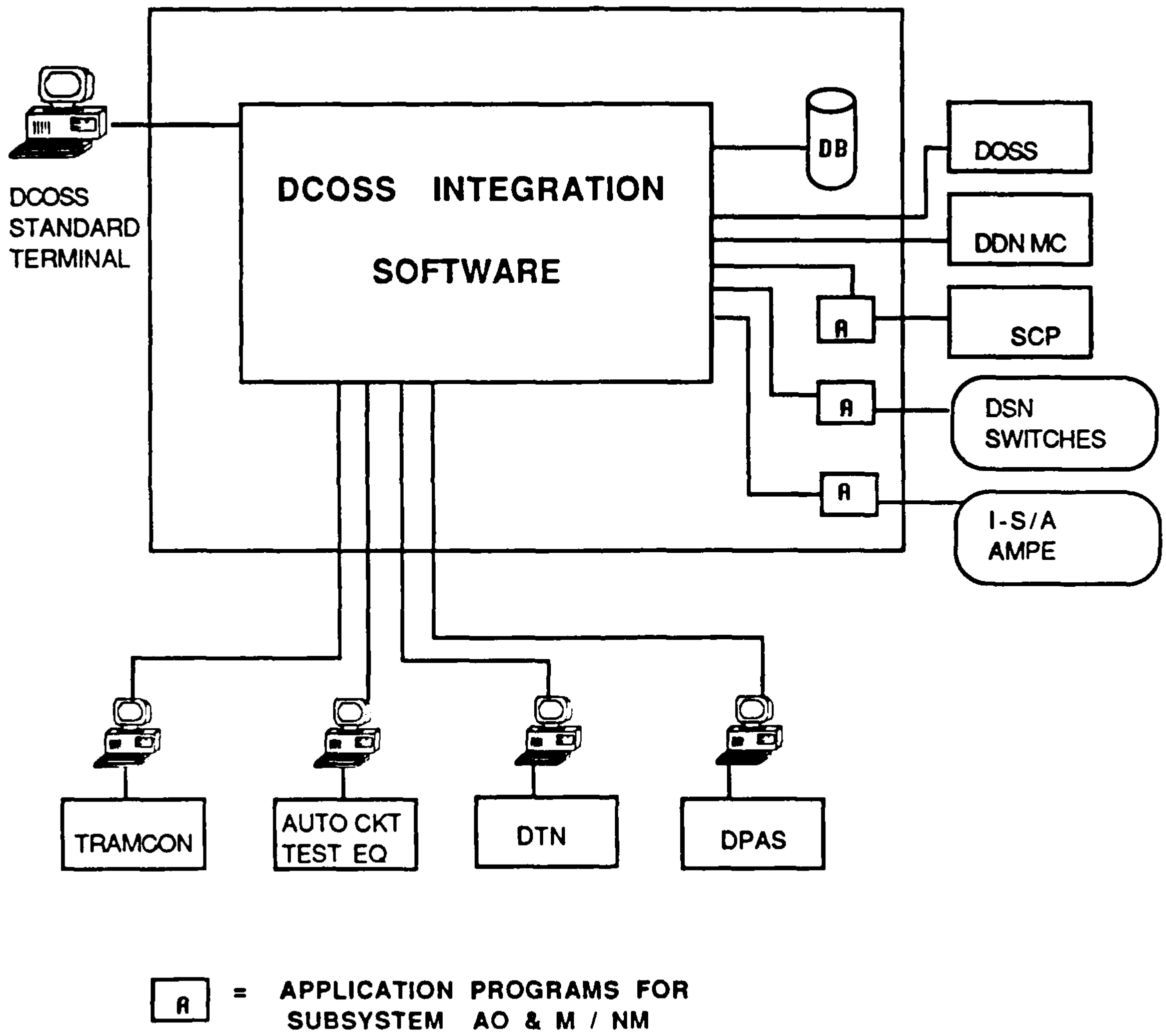

FIGURE 5-1
DCOSS CONTROL INTEGRATION

instructions to alleviate network problems. The switches will also send traffic and call data to the ACOC DCOSS which will in-turn be forwarded to the WWOLS for distribution or processing. After the NDCS has been successfully integrated, other operational support systems will follow so that DCOSS can effectively support all digital switches and DSN support systems. The DCOSS will enable ACOC controllers to perform real-time monitoring, control, and network configuration of DSN subsystems from the ACOCs and SRCFs.

5.1.1 ACOC Functions and Responsibilities

The DCOSS will assist ACOC and AACOC controllers with the following functions and responsibilities in accordance with DCAC 310-70-1 (Draft), February 6, 1986.

a. Coordinate control actions affecting theater-wide service and specified service to designated users.

b. Coordinate control actions between and among Subregional Control Facilities.

c. Direct and monitor control actions of assigned

Subregional Control Facilities and other subordinate units.

d. Inform commands and agencies of serious disruptions to their communications.

e. Monitor and analyze status of subordinate facilities, systems and trouble reports.

f. Coordinate actions to identify and localize faults within multiple link configurations that cross Subregional Control Facility (sector level) boundaries.

g. Conduct traffic, network and configuration control.

h. Control theater transmission systems.

i. Coordinate with agencies having theater-wide communications responsibilities and keep them informed of operational status of assigned facilities and systems.

j. Direct, monitor and supervise restoral/reroute actions within a theater in accordance with centralized restoral plans.

k. Monitor and supervise timely actions to correct degradations that affect facility and system performance and user service.

l. Develop, coordinate and publish centralized restoral plans.

m. Report to and respond to direction from the Network Contol Faciltiy at the DCAOC.

5.1.2 ACOC Management and Control System

The system at the ACOC for controlling the DCS will be the Defense Communications Operations Support System (DCOSS). The following sections will discuss DCOSS hardrdware and software elements:

5.1.2.1 DCOSS, ACOC and AACOC Hardware

The DCOSS at the ACOC or AACOC (theater level) will run on IBM 4300 series or equivalent computers. See Figure 5-2. IBM Series 1 or equivalent computers will be used as front end processors. The following is a complete listing of ACOC and AACOC DCOSS hardware:

a. (1) each IBM 4331 Computer, or equivalent.

b. (2) each IBM Random Access Storage Units, or equivalent.

c. (2) each IBM Tape Drive, or equivalent.

d. (1) each IBM 4331 Operator Console, or equivalent.

e. (4) each IBM 3270 PC, or equivalent, workstations with random access storage, large screen, high resolution display and printer.

f. (1) each IBM Series 1 Computer, or equivalent.

g. (1) each IBM Series 1 Computer Operations Console (CRT, printer, and stand).

h. (4) each Secure Voice Terminal.

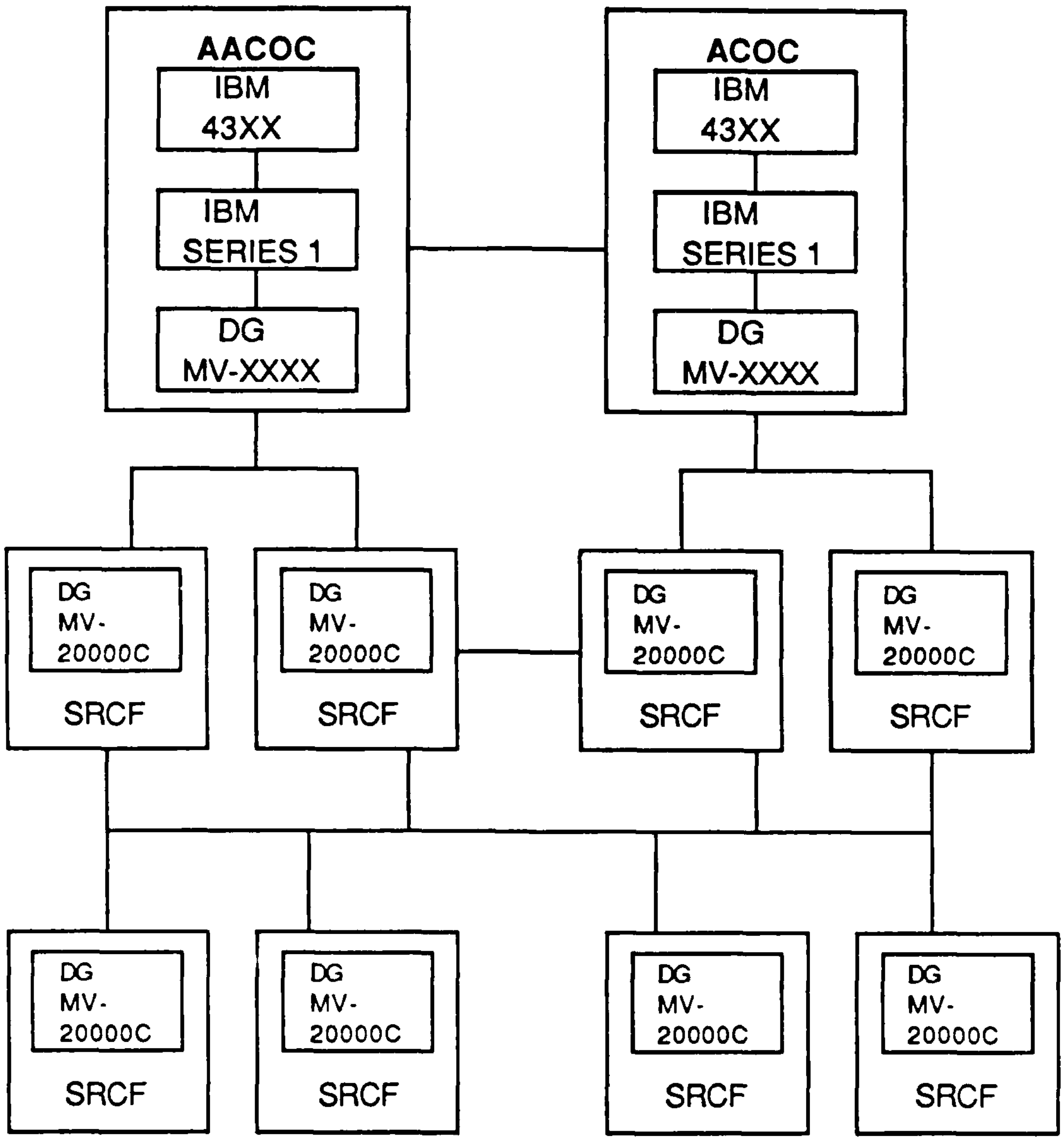

FIGURE 5-2
DCOSS ARCHITECTURE

i. (1) each Unsecure DSN phone.

j. (1) each Unsecure voice orderwire phone.

k. Supervisor desk and chair.

l. Disk and tape racks, as appropriate.

m. (5) each workstations and consoles.

5.1.2.2 DCOSS NCF/RCF Software

NCF and RCF Software will consist of the following:

a. 5664-167 VM/SP System Product

b. 5719-XS4 EDX Basic Supervisor And Emulator V4

c. 5719-CX1 EDK System/370 Channel Attch

d. 5719-HDZ Ser/1 EDX X.25/HDLC Comm SPT

e. 5748-XPI Remote Spooling Comm Subsystem

f. 5748-XXB

g. 5748-F03VS Fortran Compiler and Library

h. 5748-SA1VM/IPCS Extension

i. 5746-AM2 VSE/VSAM

j. 5740-CB1OS/VS Cobol Compiler and Library

k. 5734-PL3OS/VS PL/I Optomizing Compiler and Library

5.1.3 ACOC DCOSS Criterion

The DCOSS will provide an automated means by which the various related elements of the DCS and DCS control will be integrated at and below the theater level. The following sections describe baseline and advanced criterion for system implementation.

5.1.3.1 Baseline Criterion

This section examines that set of baseline capabilities required for successful near-term implementation of DCOSS at the theater level. Both system and interface criterion are examined.

5.1.3.1.1 Hardware

With the exception of computer operator consoles, all terminals connected to DCOSS will be DCOSS Standard Terminals (DTSs). The DST will be capable of operating in the following three modes: (1) TTY terminal, (2) DDN compatible terminal and (3) stand alone terminal.

The DST will provide the capability to issue switch and transmission controls, update the data base, receive alarms and generate reports. Each DST will be capable of interfacing with the system in three modes:

a. Terminal to Terminal Mode. This mode will be used for communication with other DSTs.

b. Terminal Emulation Mode. This mode provides the capability for any DST to interact with a distant switch or transmission equipment as if the DST was a local terminal.

c. System Mode. This mode views entire systems (e.g. TRAMCON, DPAS, etc.) as a single subsystem with which the DST will interact to perform required functions.

5.1.3.1.2 Software

The DCOSS will use a totally integrated, relational data base. A core set of common user data including circuit and location identifiers will be provided as well as the capability to extend core data to meet specific user requirements. A Data Base Administrator (DBA) will be identified at each location to ensure appropriate procedures are set-up and used for the administration and maintenance of the DCOSS data base.

5.1.3.1.3 Interfaces

The ACOC DCOSS will support data connections in the dedicated circuit and packet switched modes. The International Organization for Standardization (ISO) Open System Interconnection (OSI) reference model will be used to describe the architecture in detail. See section 5.1.4. DCOSS standard terminals (DSTs) will interface with other DSTs at all levels of the DCS heirarcy as required.

The ACOC DCOSS will interface directly with the Network Data Control System.

5.1.3.1.4 Operational Implementation

The primary mode for DCOSS operation will be real-time. The capability for DCOSS Standard Terminals (DSTs) to perform nonreal-time functions without degrading real-time performance will also be provided.

The ACOC and AACOC DCOSS will have theater and worldwide status of DCS health and status and will perfom fault isolation across SRCF boundaries. Additionally, the ACOC DCOSS will assist SRCFs in fault analysis.

ACOC personnel will develop automated restoral plans using the DCOSS. These plans will be stored at the ACOC DCOSS and transmitted when convenient or in real-time for immediate action. ROUTER software will be available to support this function.

THE ACOC DCOSS will implement pre-established network controls when requested by a network controller who will enter the desired command. DCOSS automatic data processing equipment will disseminate the directives to appropriate

SRCFs. This automation will improve the rerouting, restoration and reconfiguration of the DCS by making optimum use of remaining network resources. The ACOC DCOSS will take single entry commands and break them down into commands for transmission to multiple network equipment.

The DCOSS will also provide real-time configuration control during normal operations. Telecommunication Service Orders (TSOs), and Defense Switched Network (DSN) routine table changes will flow through DCOSS communications facilities and automatically update system configuration data bases. Reports on actions taken at lower levels (communications reroutes, equipment replacements, etc.) will automatically update configuration data bases at the ACOC.

5.1.3.1.5 Operational Procedures

ACOC personnel will receive information from and provide direction to Sub-Regional Control Facilities personnel. The ACOC DCOSS will receive messages from SRCF DCOSS equipment that will include accurate information on system status, system configuration, traffic data, equipment performance, equipment reliability, and equipment inventory. This information will support headquarters and

area headquarters staff personnel and will result in improved quality assurance, better logistics support, and a better engineered network.

ACOC personnel will produce standard and special purpose reports from data contained in the DCOSS data base. These reports will be transmitted to other DSTs when requested.

5.1.3.2 Overall System Enhancements

Overall system enhancements to the ACOC DCOSS will include Advanced Data Correlation, Advanced System Mode Operation, Data Base Integrity Processing, Distributed Data Base Operation and Automatic Reroute Plan Generation.

The Advanced Data Correlation capability will enable ACOC personnel to program correlation data into the DCOSS thereby alleviating the manual correlation burden. An example of advanced data correlation would include correlation of logical alarms and status data with physical equipment. The Advanced System Mode operation will allow high level functions to be implemented with one command. The Distributed Data Base Operation will permit development and use of a single DCOSS data base. Each DST will store its local data and have access to a centralized data base. The scope and depth of information available on DCOSS will

permit the optimal circuit/trunk reroutes when basic parameters are identified.

5.1.3.2.2 System Interface Enhancements

Additional systems with which the DCOSS will interface include:

a. DOSS
b. AMPE M/C
c. DDN M/C

5.1.4 ACOC DCOSS Interfaces

In the near-term, the DCOSS will interface with the World Wide On Line System (WWOLS) and the Defense Satellite Communication System (DSCS) Operation Support System (DOSS). In the future, DCOSS will also interface with the Automated Message Processing Equipment Monitoring Center and Defense Data Network Monitoring Center. This section describes the hardware, software and protocols necessary to support these interfaces. The International Organization for Standardization (ISO) (7) Layer Open System Interconnection (OSI) reference model is used as a framework for this discussion. See Figure 5-3.

OSI LAYER	DCOSS PROTOCOL
APPLICATION	To be determined
PRESENTATION	TELNET FTP SMTP
SESSION	NO DOD EQUIVALENT
TRANSPORT	TCP/IP ICMP
NETWORK	DDN X.25
DATA LINK	DDN X.25 LAPB
PHYSICAL	DDN X.25 RS 449

FIGURE 5-3
OSI LAYER PROTOCOLS

5.1.4.1 Application (Layer 7)

DCOSS application programs shall transfer commands, action requests, responses, reports, alarms and data files in either direction as determined by the specific application process. Specific formats, content and volumes of data are to be determined. The application layershall have the capability to:

a. open connections,

b. send data,

c. prioritize data,

d. receive data,

e. close connections, and

f. receive and act upon DDN Network Status

5.1.4.2 Presentations (Layer 6)

Department of Defense TELNET, FTP and SMTP protocols shall be used for the Presentation Layer. These protocols will satisfy terminal connection to processor, file transfer and mail transfer requirements of the application layer.

The IBM VM Interface Program for TCP/IP includes TELNET, FTP and SMTP software developed in accordance with DARPA RFC 764, DARPA RFC 765 and DARPA RFC 821, respectively. TELENET and Full Screen Package (FSP) software support local terminal to communications with remote terminals or processors. FTP provides file transfer capability to/from remote hosts. SMTP provides the capability to send mail to remote users using the CMS command.

5.1.4.3 Session (Layer 5)

There is no government protocol equivalent for the Session Layer. The OSI-equivalent functions for this layer are processed in other levels.

5.1.4.4 Transport (Layer 4)

TCP/IP and ICMP shall be used for the Transport Layer. IBM VM Interface Program provides TCP, IP, and ICMP that is used to process communications for an internetwork connection. The Network Control Facility (NCF) TCP/IP shall support one or more connections to the alternate ACOC. Consequently the ACOOCOP/IP shall support one or more connections to the NCF.

5.1.4.5 Network (Layer 3)

The Network Layer shall be as specified in DDN X.25.

5.1.4.6 Link (Layer 2)

The Link Layer shall be as specified in DDN X.25. The Link Access Procedure Balances (LAPD) as cited in FIPS-100 (July 6, 1983) shall be used.

5.1.4.7 Physical (Layer 1)

The Physical Layer shall be as specified in DDN X.25. RS-449 connectors shall be used.

5.2 Defense Satellite Communications (DSCS) Operations Support System (DOSS)

The DOSS is an Operations Support System specifically designed to control and monitor the Defense Satellite Communication System (DSCS). The DOSS control structure parallels the DCOSS from the satellite ground terminal or facility level to the ACOC at the theater level. DOSS and DCOSS control is integrated at the theater level. Other Operation Support Systems integrated at with DCOSS at the

theater level are the Automated Message Processing Equipment Monitoring Center (AMPE & M/C) and Defense Data Network Monitoring Center (DDN M/C).

5.2.1 DOSS Functions and Responsibilities

The DOSS will assist the ACOC by performing the following functions and responsibilities:

a. Report and respond to direction from the ACOC within the timeframe specified.

b. Control all satellite accesses by directing, monitoring and controlling earth terminal transmission parameters for each link.

c. Conduct trunk, link and network establishments in response to ACOC direction.

d. Respond to the ACOC for implementation of restoral plans and actions for network problems affecting communications service.

e. Monitor and direct special user networks in accordance with the authority delegated by the ACOC.

g. Maintain the DOSS operational data base.

h. Maintain the satellite communications payload configuration by executing commands to the satellite.

i. Support the Air Force Satellite Control Facility satellite commanding and telemetry requirements when directed by the ACOC.

5.3 Sub-Regional Control Facility(SRCF)

The SRCF is the primary operations facility for transmission and switching control in a subregion of the DCS. It provides operation and maintenance as well as system control and administration functions. The SRCF will augment and eventually replace the present Facility Control Offices (FCOs) (See Figure 1.1 and Figure 4-1).

The integration of switching and transmission control at the SRCF level will promote efficiency in normal conditions and enhance survivability under stress. SRCF responsibilities include system control and administrative reporting during normal operation. The SRCF is also responsible for centralized operations and maintenance for

the stations within the subregion. During contingency operations, the SRCF responsibilities include system control for the region in the event of a loss of the ACOC and AACOC.

The SRCF works closely with the station level elements for subregion operation and maintenance. By using DCOSS, the SRCF has more effective control of switching and transmission systems at the station level. Automatic data processing support will be used to implement more effective remote control and centralized functions such as alarm reporting, fault isolation, patching, testing, status reporting and record keeping.

The SRCFs will provide an optimal blend of centralized and distributed processing, directing economical operation on a daily basis and also meeting critical user needs in time of stress. To meet these needs, functional requirements of the DCS have been divided into three areas: system control, operation and maintenance, and administration.

Those real-time activities necessary to configure, restore and ensure effective performance of the DCS are designated "system control." These activities include

network management for switching systems and transmission management for transmission systems. The SRCF will perform the following system control activities:

a. Switch Traffic Monitoring
b. Switch Network Management
c. Service-Affecting Fault Alarm Monitoring
d. Transmission Management
e. Critical user service restoral for Defense Switched Network (DSN) switch failures
f. Information Correlation

Those activities necessary to operate and maintain all switching and transmission equipment needed for user service are designated "operations and maintenance." The SRCF will perform the following operations and maintenance activities:

a. Service Provisioning
b. Corrective Maintenance
c. Preventive Maintenance
d. Resource Implementation
e. Directory Service Assistance

Those nonreal-time planning, reporting and general

record keeping activities required to provide user service are designated "administration." The SRCF will perform the following administrative activities:

a. Record Keeping

b. Reporting

c. Operations Planning

5.3.1 SRCF Functions and Responsibilities

The DCOSS will assist with the following functions and responsibilities of the SRCF controllers in accordance with DCAC 310-70-1 (Draft), February 6, 1986:

a. Coordinate control actions affecting sector levels and specified services to designated users.

b. Coordinate control actions between nodal levels of responsibility.

c. Direct control actions of assigned nodal levels.

d. Advise users of serious disruptions to their communications capabilities as directed through commandchannels

e. Monitor and analyze the status of facilities, networks and subsystems under their control.

f. Analyze and develop trends in quality of service and trouble reports based on performance data from nodal level elements.

g. Direct and coordinate activities to identify and localize faults within multiple link configurations.

h. Conduct traffic control, network and configuration control, system level restoral, system testing and performance analysis.

i. Coordinate with agencies having sector wide communications responsibilities (subordinate component commands, communications operating groups and foreign and local carriers) keeping them informed of operational status of assigned facilities and systems.

j Direct and monitor restoral and reroute actions within the sector in accordance with approved centralized restoral plans and develop,

coordinate, and publish sector level restoral plans.

k. Monitor, supervise and direct actions to correct degradations that affect facility, network, and system performance within the sector.

l. Coordinate with adjacent, control levels to ensure continuity, quality and availability of service over multiple links.

m. Respond to direction from higher control levels.

n. Coordinate with commercial carriers to effect restoral of leased facilities when it is beyond the capability of the local TCF.

5.3.2.1 SRCF DCOSS Hardware

The DCOSS at the SRCF will be run on Data General Eclipse MV-20000C or equivalent computers. The following is a complete listing of SRCF DCOSS hardware:

a. (1) each Data General Eclipse 20000C with the following circuit boards.

1. (1) each 8988 VPU with 4MB MOS Memory.
2. (1) each 8704 Floating Point.
3. (1) each 6237 Disk Controller.
4. (1) each 6300 Mag Tape Controller.
5. (1) each 4370 IAC/16 Comm Controller.
6. (1) each 4380 ISC 2 Comm Controller.
7. (1) each 4363 Printer Controller.

b. 6300 Mag Tape Cabinet.

c. 6300 Mag Tape Drive.

d. 4372 TCB-16 Terminal Connector Block.

e. 6237 1062 MB Disk Drive System.

f. 1344 Comm Cabinets

g. Forms Storage Cabinet.

h. Mag Tape Storage Cabinet.

i. File and Shelf Storage.

j. Status Display Board.

k. 4364 436 LPM Band Printer.

l. 4535 Multifunction Printer.

m. (3) each IBM PC Printers.

n. (3) each 3270 IBM PC Systems or equivalent.

o. 6194 Dasher TP2 KSR.

5.3.2.2 SRCF DCOSS Software

The following is a listing of software for SRCF DCOSS facilities. This software is designated to run on the Data General Eclipse MV-20000C computer:

a. VS Operating System

b. AOS/VS

c. AOS Fortran 5

d. AOS/VS PL/I

e. AOS/VS DG/SQL Data Base Managment System

5.3.3 SRCF DCOSS Criterion

The DCOSS will provide an automated means by which the various related elements of the DCS and DCS control will be integrated at and below the theater level. The following sections describe baseline and advanced criterion for system implementation.

5.3.3.1 Baseline Criterion

This section examines the set of baseline capabilities required for successful implementation of DCOSS at the SRCF level. Both system criteria and interface criterion are examined.

5.3.3.1.1 Hardware

With the exception of computer operator consoles, all terminals connected to DCOSS will be DCOSS Standard Terminals (DSTs). The DST will be capable of operating in the following three modes: TTY terminal, DDN-compatible terminal, and stand-alone terminal. The DST will provide the capability to issue switch and transmission controls, update the data base, receive alarms and generate reports. Each DST will be capable of interfacing with the system in three modes:

a. Terminal to terminal mode. This mode will be used for communication with other DSTs.

b. Terminal Emulation Mode. This mode provides the capability for an SRCF DST to interact with a distant switch or the SRCF-DST was transmission equipment as if the SRCF-DST was a local terminal.

c. System mode. This mode views entire systems (e.g. TRAMCON, DPAS, etc.) as a single subsystem with which the DST will interact to perform required functions.

5.3.3.1.2 Software

The DCOSS will use a totally integrated, relational data base. A core set of common-user data including circuit and location identifiers will be provided as well as the capability to extend core data to meet specific user requirements. A Data Base Administrator (DBA) will be identified at each SRCF location to ensure appropriate procedures are set up and used for the administration and maintenance of the DCOSS SRCF data base.

5.3.3.1.3 Interfaces

The SRCF DCOSS will support data connections in the dedicated, circuit switched and packet switched connection modes. The International Organization for Standardization (ISO) Open System Interconnection (OSI) reference model will be used to describe the architecture. See section 5.1.4.

DCOSS terminals will interface with other DCOSS terminals at all levels of the DCS heirarchy, as required. In addition, the terminals will interface with stand alone, multifunction and end office DSN switches.

The SRCF DCOSS will interface with the following transmission systems:

a. TRAMCON

b. DPAS

c. Automated Circuit Test Equipment

d. Low Speed Time Division Multiplexers

The SRCF DCOSS will also interface with building environmental monitoring and control systems at unmanned switch and transmission facilities. The system will monitor the status of building power, DC batteries, heating, doors, etc., in these facilities and notify remote SRCF personnel of abnormal conditions through the DCOSS alarm system.

5.3.3.1.4 Operational Implementation

The DSTs will operate in real-time to perform functions identified in section 5.3.1. The capability to perform nonreal-time functions without degrading real-time performance will also be provided. Network management alarm and command responses will be accomplished in real-time.

SRCF personnel will use the DCOSS to store automated restoral plans developed by the ACOC and will transmit them to subordinate centers. These may be preplanned and transmitted when convenient, or computed in real-time and transmitted for immediate action. Router software will be available to support this function.

The SRCF DCOSS will implement pre-established network controls when directed by a network controller. A network controller will enter the desired command and the DCOSS automatic data processing equipment will disseminate the directives to the appropriate subsystem monitoring centers. This automation will improve the rerouting, restoration and reconfiguation of the DCS by making optimum use of remaining network resources. The SRCF DCOSS will take single entry commands and break them down into commands to multiple network equipment.

The SRCF DCOSS will provide real-time configuration control through system modifications and additions. Telecommunication Service Orders (TSOs), Defense Switched Network routing table changes etc. will flow through the DCOSS communications facilities automatically updating system configuration data bases. Reports on actions taken at lower levels (Technical Control Facility

actions, in-effect reports, etc.) will automatically update configuration data bases at the SRCF and ACOC.

5.3.3.1.5 Operational Procedures

SRCF personnel will receive direction from the ACOC and AACOC DCOSS consistent with operational procedures in their theater. The SRCF DCOSS will also receive information from and provide direction to nodal level Technical Control Facilities and will assist Technical Control Facilities and subsystem monitoring centers in fault analysis. The SRCF DCOSS will have regional and theater wide status of system health and will perform fault isolation across Nodal Technical Control Facilities and subsystem boundaries.

The SRCF DCOSS will receive reporting messages from nodal technical control facilities providing accurate information on system status, system configuration traffic data, equipment performance, equipment reliability and equipment inventory. This information will support the SRCF staff resulting in improved quality assurance, better logistics support and a better engineered network.

SRCF personnel will produce standard and special purpose reports from data contained in the DCOSS data base. These reports will be transmitted to other DSTs on an as required basis.

5.3.3.2. System Enhancements

Overall system enhancements to the SRCF DCOSS will include Advanced Data Correlation, Advanced System Mode Operation, Data Base Integrity Processing, Distributed Data Base Operation, and Automated Reroute Plan Generation. The Advanced Data Correlation capability will enable SRCF personnel to program correlation data into the SRCF DCOSS thereby alleviating the correlation burden on SRCF personnel. An example of advanced data correlation would include correlation of logical alarms and status data with physical equipment. The advanced system mode operation will allow high level functions to be implemented with one command. The Distributed Data Base Operation will permit development and use of a single DCOSS data base. Each DST will store its local data and have access to data in a centralized data base. The scope and depth of information available on DCOSS will permit optimal circuit/trunk reroutes when basic parameters are identified.

5.3.3.3 Interface Enhancements

Additional systems with which the SRCF DCOSS will interface include:

a. Defense Communication Satellite System.

b. Secure Voice Circuit Switch.

c. Base Central Test Facility.

d. Technical Control Operations Support System.

5.3.4 SRCF DCOSS Interfaces

The SRCF DCOSS will interface with other SRCF DCOSS facilities, ACOC and AACOC DCOSS facilities, TRAMCON and DSN facilities. Configuration at particular levels of the OSI model is described in section 5.1.4.

CHAPTER VI

Nodal and Facility Level Architecture

6.0 Introduction

This chapter discusses the station level control architecture as implemented under the Defense Communications Agency Operations Support System (DCOSS). The station level includes Technical Control Facilities (TCFs) and major TCFs (Nodal Facilities). Nodal Facilities are major switching centers. (See Figure 6-1).

This chapter will describe the TCFs and Nodal Facilities in terms of the following areas:

a. Functions/Responsibilities

b. Management and Control Systems

c. DCOSS Hardware and Software

d. Functional Interfaces

6.1 Functions/Responsibilities

6.1.1 Nodal (Level 4)

Nodal control is the fourth level of control and is

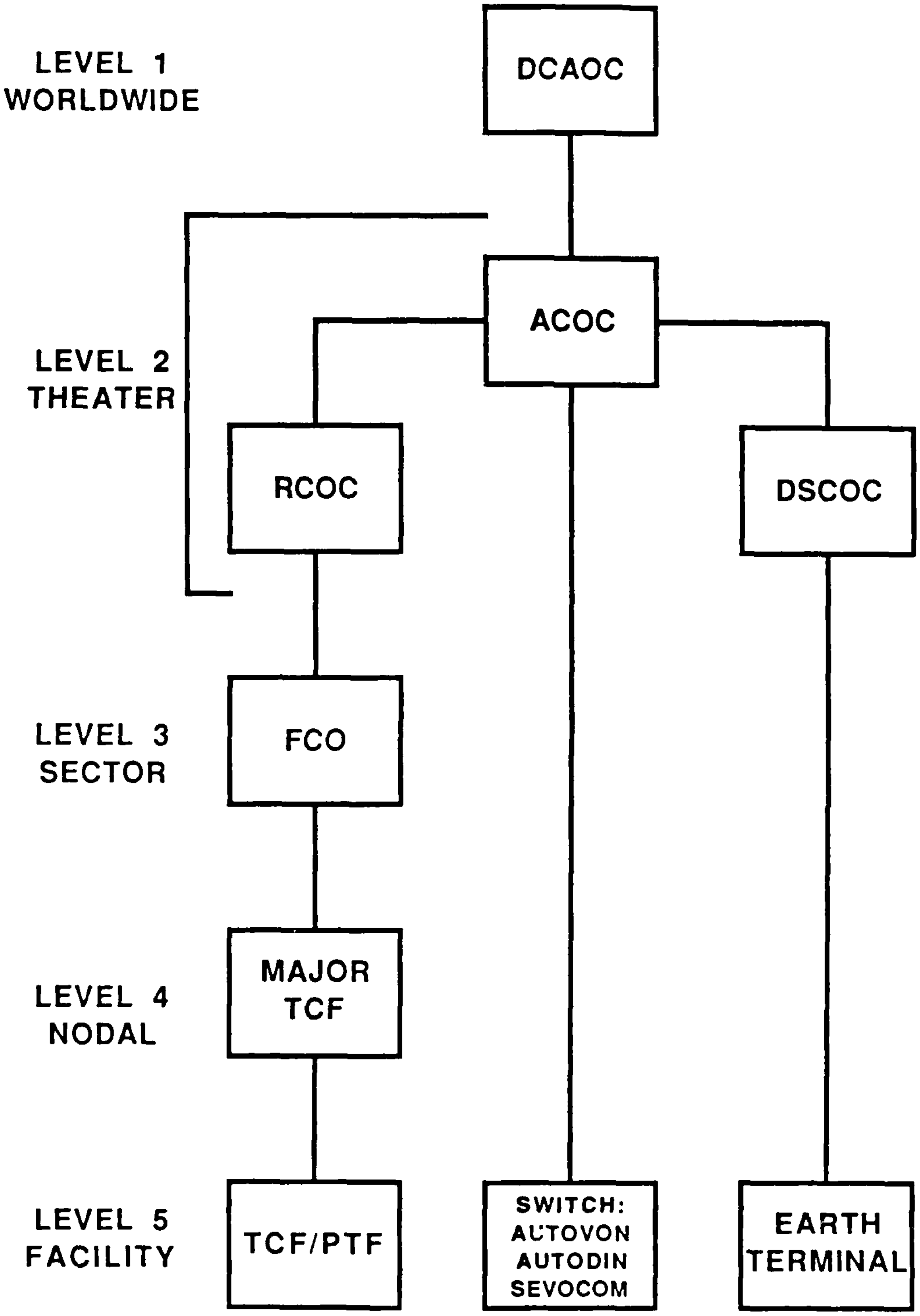

FIGURE 6-1
DCS CONTROL HEIRARCHY

associated with a major technical control facility or a major switching node such as a DSN Switch or Immediate Switching Center. The responsibilities of the nodal controller are:

a. Coordinate control actions affecting nodal levels and specified serviced to designated users.

b. Coordinate control actions between facility levels of responsibilities.

c. Direct control actions of assigned facility levels.

d. Exercise configuration control over constituent facilities.

e. Advise users of serious disruptions of their communications capabilities through command channels.

f. Control the sending, measuring, parameter thresholds settings, and storing of measurement data and alarms.

g. Monitor equipment and subsystem performance.

h. Measure quality assurance performance parameters.

i. Direct and coordinate activities in identifying and localizing faults.

j. Reroute and restore disrupted circuits, trunks, and links.

k. Report to and respond to directions from higher headquarters.

l. Coordinate with other agencies having nodalwide communications responsibilities, keeping them informed of the operational status of assigned facilities.

6.1.2 Station (Level 5)

Facility control is the lowest level of control and is peculiar to a specific facility. Facility control actions are focused on local equipment using provisions built into a particular communications subsystem design. The responsibilities of the facility controller are:

a. Perfrom equipment and channel quality control.

b. Perform monitoring and testing.

c. Accomplish equipment substitution and restoral, and channel substitution, restoral, and rerouting.

d. Conduct fault isolation.

e. Perform preventive and corrective maintenance.

f. Reroute, restore, and coordinate restoration of disrupted circuits, groups, di-groups, and supergroups in accordance with published restoral plans or to the maximum extent possible.

g. Assess performance.

h. Notifying users of service disruptions and conditions affecting restoral of service.

i. Report to and respond to direction from higher headquarters.

6.2 Management and Control Systems

Actual equipment and circuit cross-connection, transmission testing, monitoring, and control implementation are carried out at the lowest level at which the Digital Patch and Access System (DPAS), Transmission Monitoring and Control System (TRAMCON), Automated Circuit Test System (ACTS), Technical Control Operating SYstem (TCOSS) reside. These operating systems typically reside at Technical Control Facilities (TCFs) and DSN Switching Centers. Such equipment as DPAS, TRAMCOM, ACTS, etc., and associated operations are not part of the DCOSS.

The present DCOSS design does not include DCOSS management and control system functions at the Nodal and Facility levels. The DCOSS will interface with existing and planned support systems to support DCOSS objectives. These interfaces will be discussed in Section 6.4.

6.3 DCOSS Hardware and Software

This section is not applicable since no [illegible] or support functions have been ident[illegible] Facility levels.

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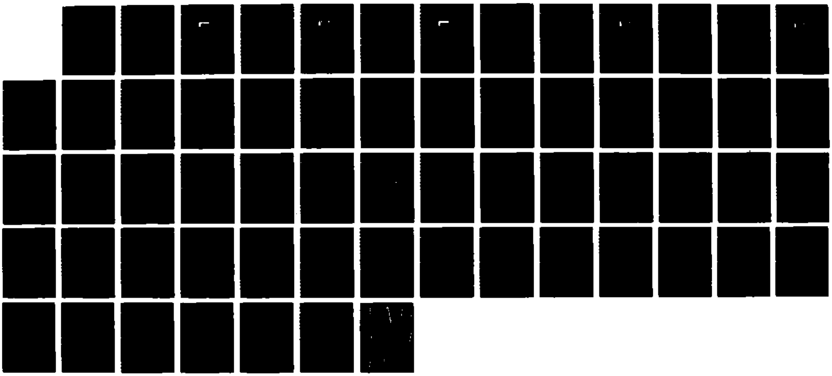

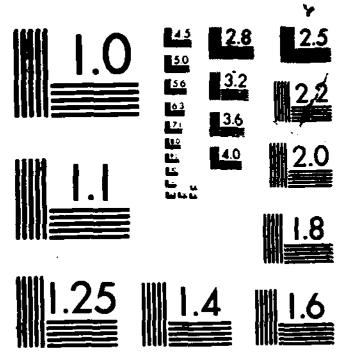

MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A

6.4 Functional Interfaces

The DCOSS will interface with existing and planned support systems (DPAS, ACTS, TRAMCON, DTN) at the Technical Control Facility (TCF) and with the DSN Switching Center located at the Nodal Level. Figure 6-2 shows the DCOSS interfaces, as planned. The following discussion will be focused on the specific interfaces shown in Figure 6-2.

6.4.1 TRAMCON Interface

The data flows across the SRCF-TRAMCON interface (See 1 on Figure 6-2) are limited to transmission of display commands, TRAMCON control commands from SRCF application programs, and to displays returned to the SRCF from the TRAMCON. The SRCF DCOSS application programs will appear to TRAMCON aoftware as local terminals.

SRCF applications programs must be able to handle updates to a display (alarms) when a SRCF controller requests activation of a particular display in the TRAMCON. The SRCF DCOSS will interact with the TRANCOM Master Terminal (TMT) to obtain DCS transmissions and related equipment alarms, status, performance monitoring

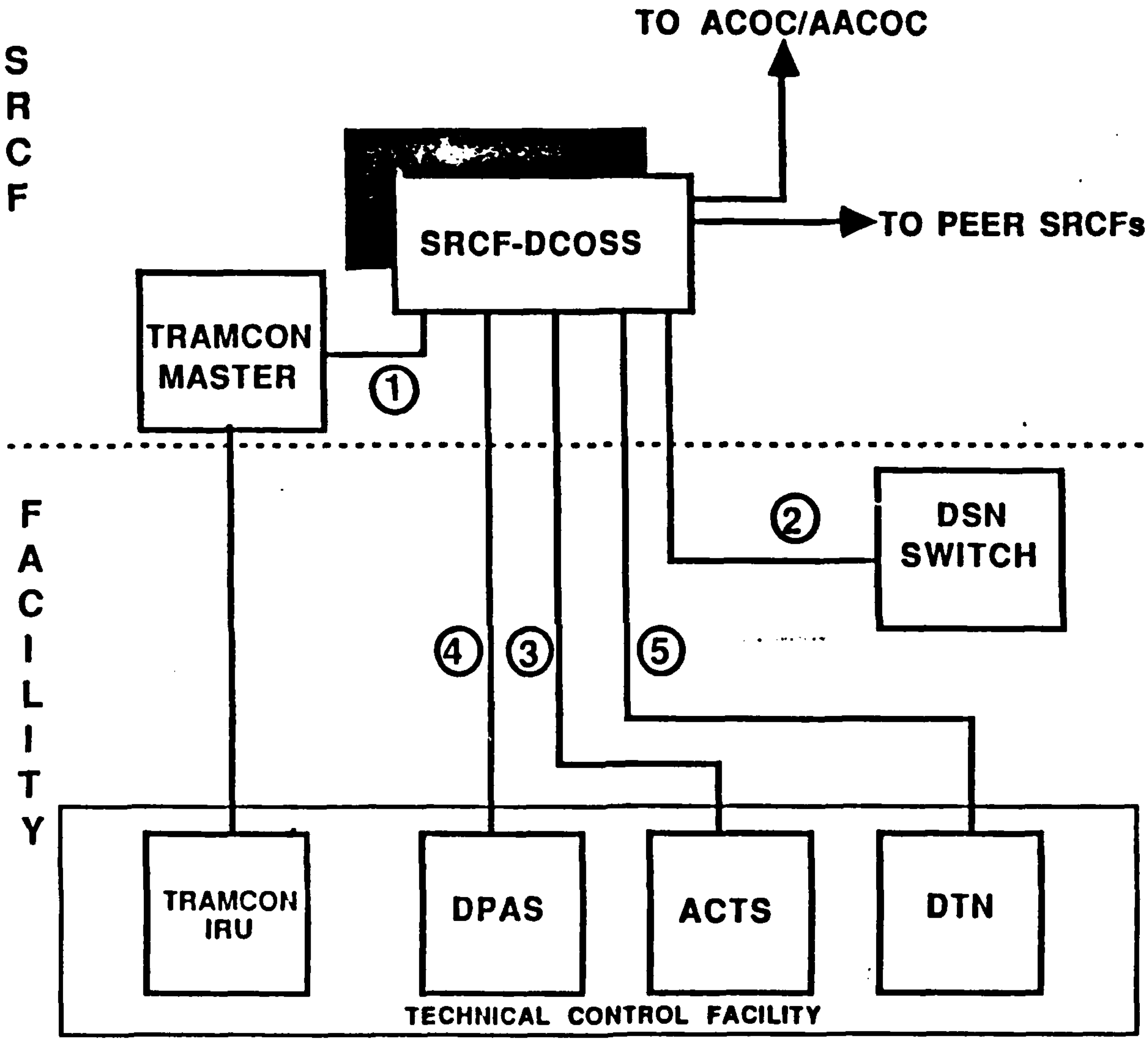

FIGURE 6-2
DCOSS SUBSYSTEM INTERFACES
AT THE SRCF AND FACILITY LEVELS

data and to update or transfer data bases. Alarm reporting, status reporting, performance monitoring data reporting, queries for such data and data base updates/transfers will be computer-to-computer process-to-process interactions. Remote terminal to TMT will also allow such interactions, but these will be terminal to computer interactions.

Connectivity will be accomplished using DOD protocol TCF/IP and DDN X.25 while higher level protocols will be contained in the SRFC computer and TRAMCON Master Terminal. PADs will be used as required.

6.4.2 DSN Interface

This interface is utilized to transfer commands, requests, reports, alarms, and data files in either direction. (See 2 on Figure 6-3). Computer-to-computer information flows will consist of the following:

a. SRCF to DSN Switch

1. Switch updates
2. Call data requests

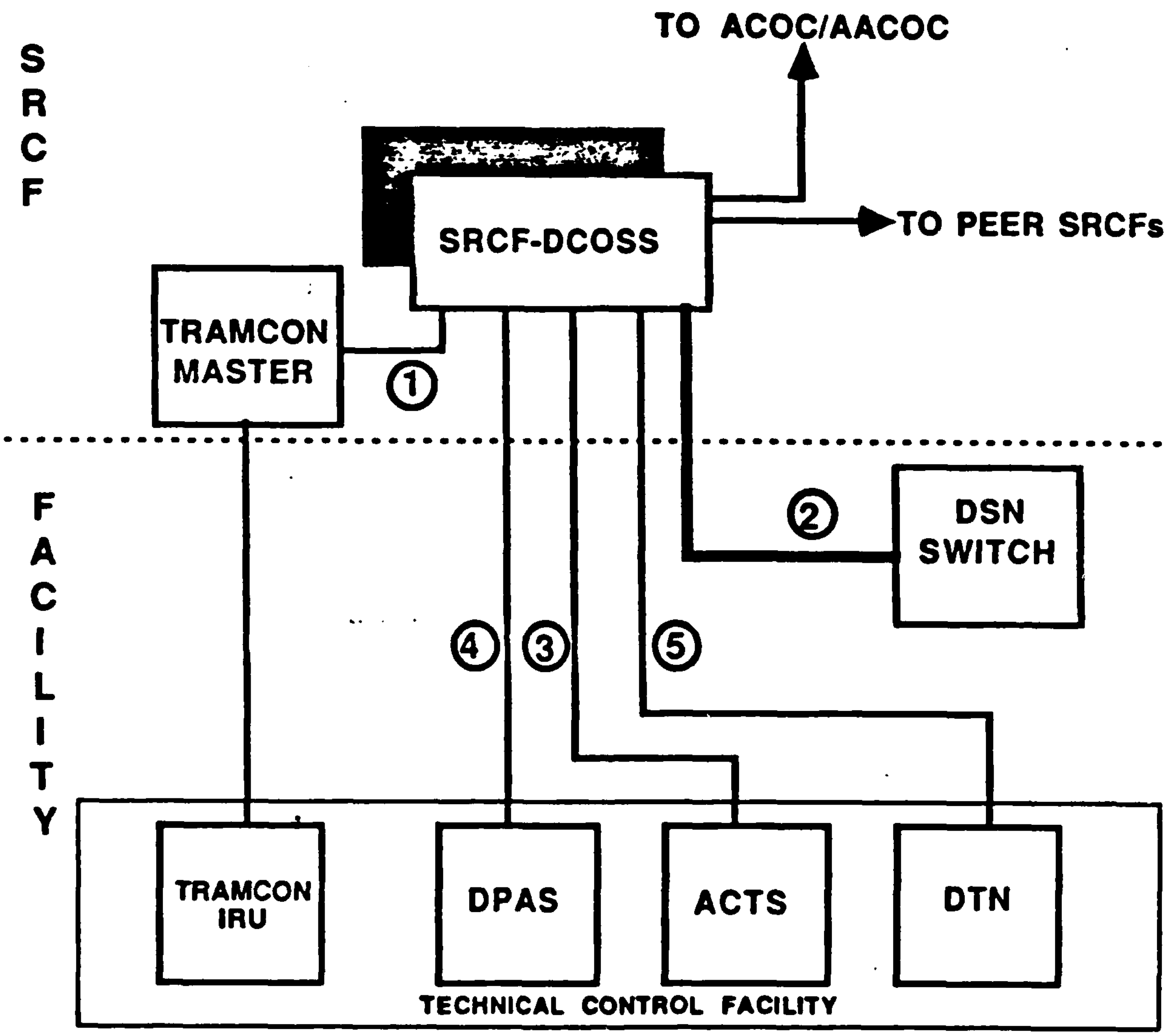

FIGURE 6-3
DCOSS SUBSYSTEM INTERFACES
AT THE SRCF AND FACILITY LEVELS

3. Traffic data requests

4. Restoral commands

5. Normalization commands

b. DNS Switch to SRCF

1. Call data

2. Traffic data

3. Switch trouble alarms

4. Switch update completed messages

5. Restoral activated messages

6. Status messages

7. Service normalized messages

8. Fault alarms

The DSN Switch will contain the higher level DOD protocols while it's PAD will contain the transport and lower layer (TCP/IP and DDN X.25). The SRCF computer and it's PAD will contain identical protocols.

6.4.3 ACTS Interface

The SRCF DCOSS will interface with the Automated Circuit Test System (ACTS). (See 3 on Figure 6-4). This test system will provide the SRCF DCOSS the capability to

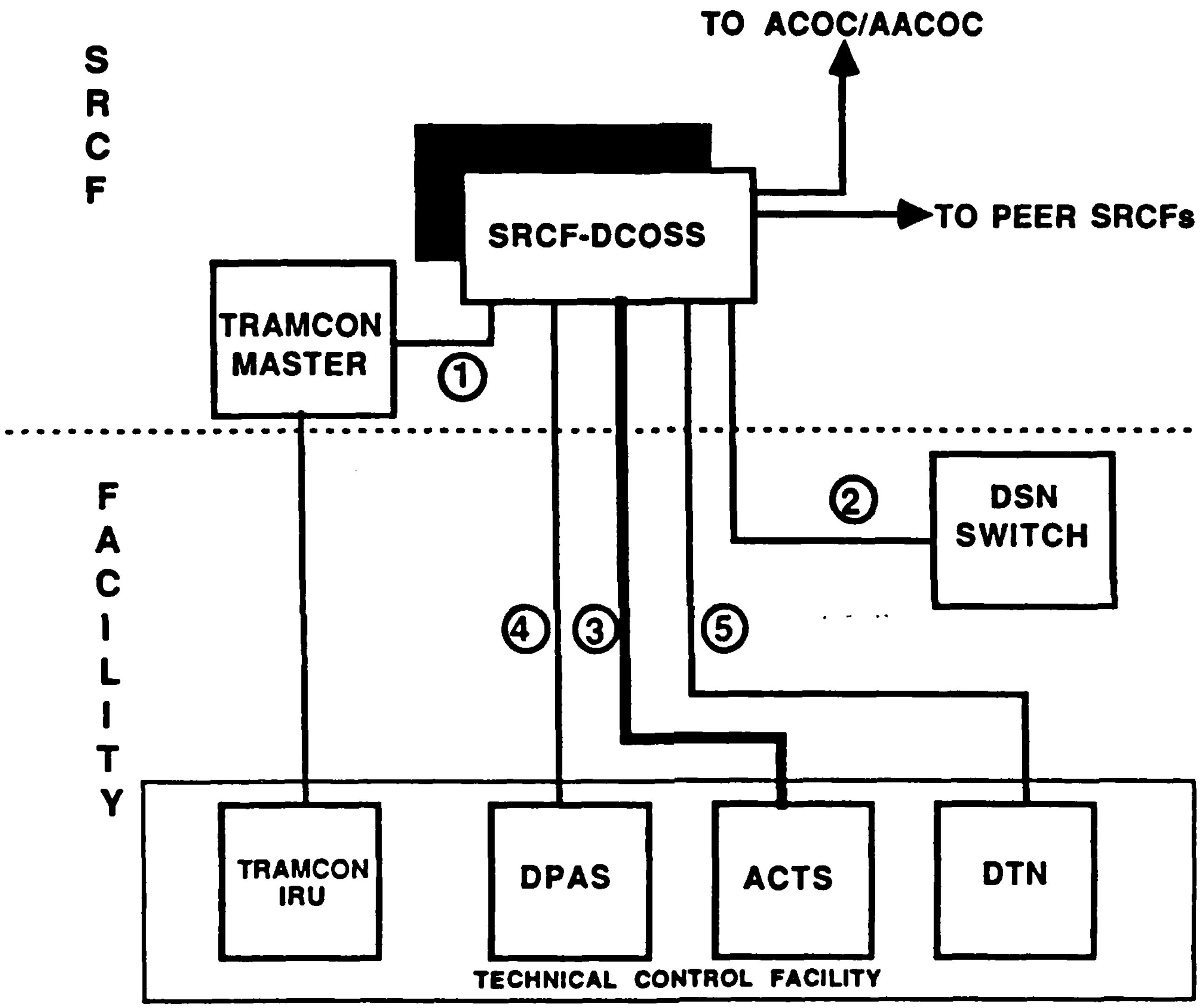

FIGURE 6-4
DCOSS SUBSYSTEM INTERFACES
AT THE SRCF AND FACILITY LEVELS

test user line circuits as well as long-haul circuits, remotely. This system is used mostly for out-of-service testing and utilizes a test access switch so that manual patching will not be necessary. The SRCF DCOSS will use a terminal evaluation program when interacting with the ACTS.

Information flows will consist of data base updates/transfers, receiver user line alarms, command controls for preprogrammed test routines within the ACTS control processors and test results from the ACTS processor. The following is a list of information transfers:

a. SRCF to ACTS

1. Command test routines
2. Request test results
3. Request status
4. Database retrieval requests
5. Update database
6. Download new/modified test routines

b. ACTS to SRCF

1. Acknowledge test routine commands
2. Transfer test results
3. Provide database information request

4. Provide status reports
5. Acknowledge database updates
6. Acknowledge new/modified test routine downloading

DOD protocols will be used with the PADs containing transport and lower layers while the primary computers will contain high level protocols. In the future, ISO protocols will be substituted for the DOD protocols.

6.4.4 DPAS Interface

The Digital Patch and Access System (DPAS) controls the cross-connect of circuits within the DCS station. (See 4 on Figure 6-5). Information flows will consist of:

a. SRCF to DPAS
   1. Cross-connect command
   2. Request for status
   3. Database retrieval requests
   4. Database updates
   5. Restoral plan updates
   6. Test access reports

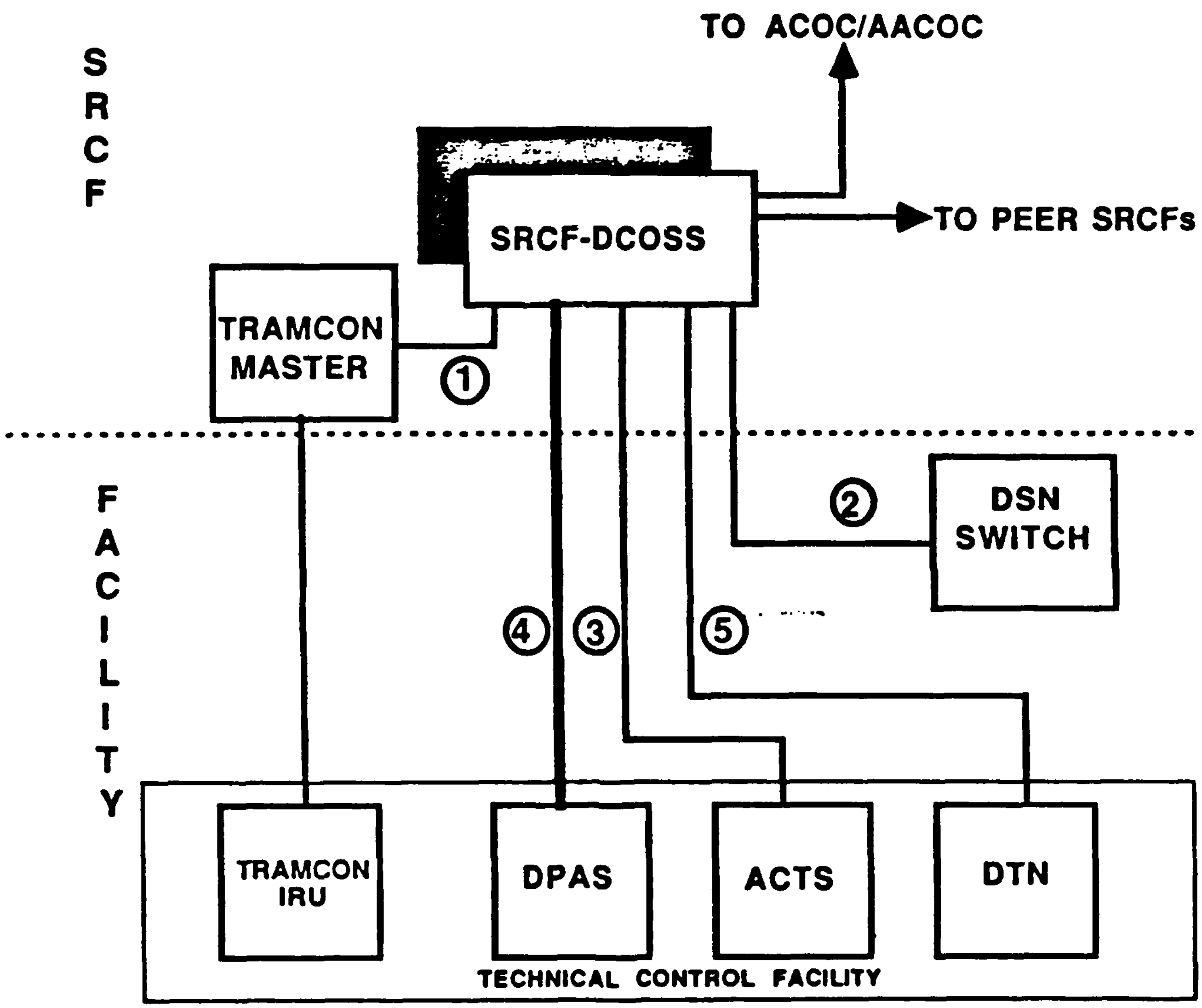

FIGURE 6-5
DCOSS SUBSYSTEM INTERFACES
AT THE SRCF AND FACILITY LEVELS

b. DPAS to SRCF

1. Action confirmation
2. Command acknowledgement
3. Fault alarms
4. Status reports
5. Database retrieval requests
6. Database update confirmations
7. Test access confirmation

The SRCF controller will be able to use his DCOSS terminal to access the DPAS and will appear as a local user to DPAS. As such, there will be commands and data records from the SRCF terminal to the DPAS computer and a return flow of information screens.

DOD protocols shall be used and PADs will contain transport and lower layer protocols while primary computers will contain higher level protocols. In the future, ISO protocols will be used.

6.4.5 DTN Interface

The SRCF DCOSS to the Digital Transmission Network (DTN) interface will allow the SRCF controller to perform

DTN functions, remotely. (See 5 on Figure 6-6). The DTN controls the Low Speed Time Division Multiplexers (LSTDM) within the DCS station. Information flows will consist of the following:

a. SRCF to DTN

1. Circuit data rates (Port rate)
2. Request for status
3. Database retrieval requests
4. Database updates
5. Restoral plan updates

b. DTN to SRCF

1. Action confirmation (Port rate charges)
2. Command acknowledgement
3. Fault alarms
4. Database retrieval replies
5. Database update confirmations

DOD protocols shall be used with PADs containing transport and lower protocol layers. DOD protocols will be replaced with ISO protocols in the future.

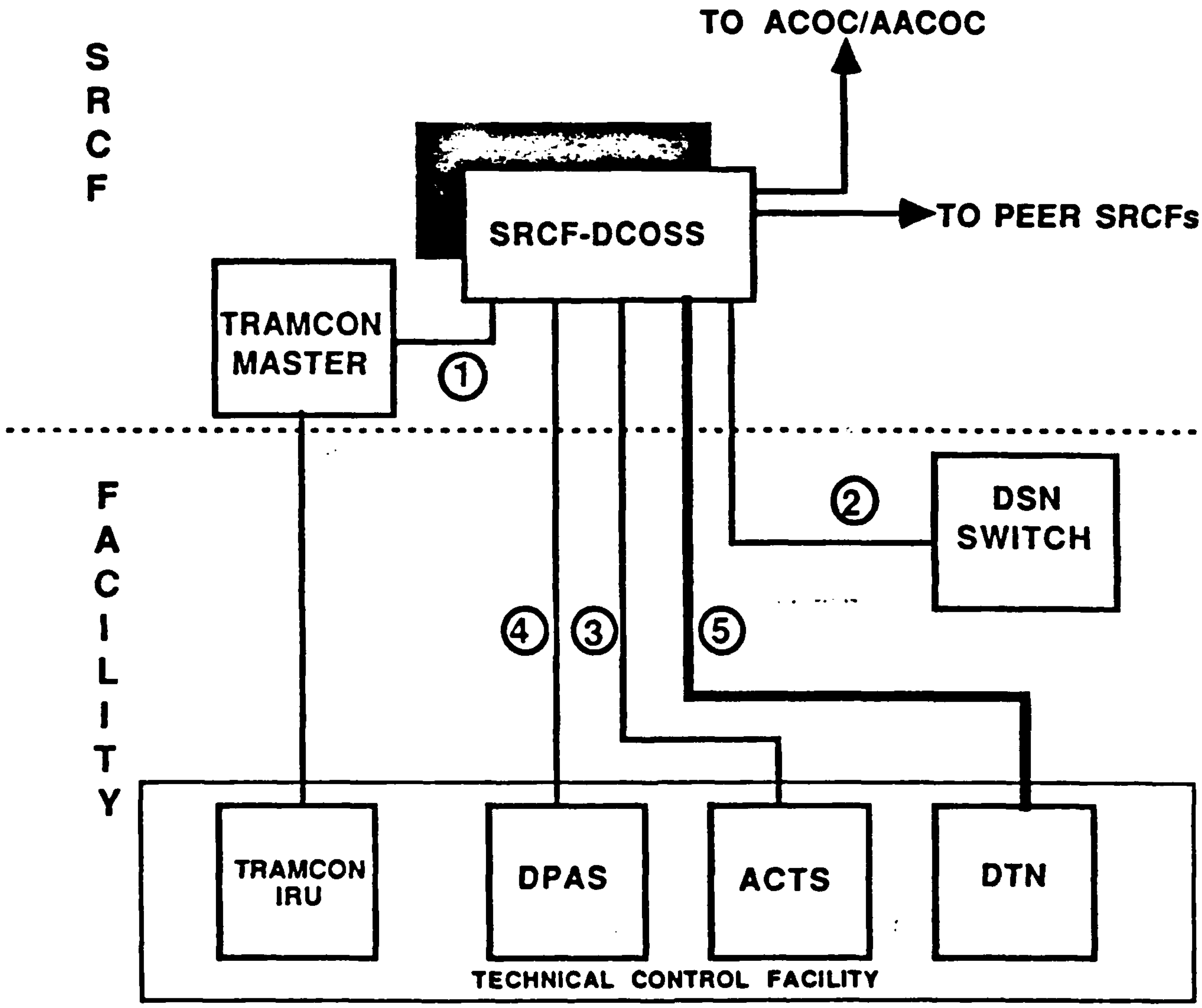

FIGURE 6-6
DCOSS SUBSYSTEM INTERFACES
AT THE SRCF AND FACILITY LEVELS

CHAPTER VII

SUPPORT REQUIREMENTS

7.0 Introduction

This chapter will discuss requirements to support the DCOSS mission. Support requirements cannot be overlooked during the design and implementation of the DCOSS. The areas that will be discussed are manpower, training, and logistics.

7.1 Manpower

The following section discusses manpower requirements for DCOSS implementation.

7.1.1 General

The DCOSS will be operated and maintained by the designated military department or agency. Each department or agency will evaluate the manpower requirements needed to accomplish their task and ensure the availability of trained personnel to meet assigned duties.

7.1.2 DCA Staffing Requirements

Implementation of the DCOSS to support the integrated DCS Control Program will not require an increase in

manpower. The ACOC Network Control Facility (NCF) and Alternate NCF will be staffed by contract personnel. The contracts will be initiated and administered by DCA. Funding will be from the Communications Service Industrial Program in support of the communications functions performed by the DCOSS.

7.1.3 SRCF Staffing

The designated military department (Army, Navy, or Air Force) will be responsible for staffing the SRCF. It is expected that existing personnel will be used to operate and maintain the DCOSS equipment during three (3) phases as outlined below.

7.1.3.1 Phase I SRCF Manpower

During the initial phase of operation, SRCFs will provide administration, operation, and maintenance (AO&M) capabilities for the Defense Switched Network implementation under DCOSS. Local site personnel will perform their current and planned functions from SRCF workstations rather than a switch maintenance terminal. As

additional DSN switches become operational, associated AO&M functions can be performed centrally from the SRCF.

7.1.3.2 Phase II SRCF Manpower

The DCOSS-SRCF implementation will provide the capability to perform selected technical control facility functions from the SRCFs. Controllers will be able to remotely access switch multiplexers, Digital Patch and Access Systems (DPAS), transmission monitoring systems, and automatic circuit testing equipment from the SRCF. At this point, technical control personnel will be transitioned from technical control facilities to the SRCFs along with their associated functions.

7.1.3.3 Phase III SRCF Manpower

This final SRCF phase will utilize general purpose controllers (see section 8.2) who will be able to perform functions at all levels of the control hierarchy and on multiple DCS subsystems.

7.2 Training

Training personnel on the operations and maintenance of DCOSS equipment is discussed in the followind sections.

7.2.1 General

The Air Force, as the lead Military Department (LMD), is responsible for developing and providing a MILDEP and DCA coordinated training program to provide DCOSS maintenance and controller training.

7.2.2 DCA Training Requirements

Training of personnel at the NCF/Alt NCFs will be provided through a DCA staffing contract. The training will be coordinated to support the DCOSS implementation at the Network Control Facility (NCF). Training will focus on network management and be implemented according to phased SRCF requirements.

7.2.3 SRCF Training

The SRCF training is phased according to the manpower requirements previously discussed. This phased approach is outlined below.

7.2.3.1 Phase I Training

During DCOSS installation at the SRCFs, the Air Force will provide initial technical guidance to on-site personnel in operation of the SRCF equipment. In addition, each SRCF site will receive two student weeks of training provided at one of the Data General Education Centers. Individuals trained at Data General will provide on-the-job training to other site personnel. Manuals for hardware/software will be provided by Data General. Specific training on hardware maintenance is not being provided since the equipment will be life cycle supported by the Air Force.

7.2.3.2 Phase II Training

Technical control personnel will be trainsitioned to the SRCF to perform transmission functions. These personnel will be trained to perform the functions addressed in section 8.1.3.2.

7.2.3.3 Phase III Training

Phase III training will include all training required for general purpose controllers with skills applicable to all levels of the DCS control hierarchy and multiple DCS subsystems. The US Air Force will have responsibility for Phase III training.

7.2.4 Training Concept

Government personnel will initially be trained using contractor courses either in-plant, at a Government training school, or on-site. Appropriate Contractor Data Requirements List (CDRL) items will be included in all procurement solicitations for the purpose of developing training programs. CDRLs will be prepared by the Air Force in coordination with the other MILDEPs and DCA.

Equipment procurements will include sufficient training equipment for the Government training facility. Training equipment must be in the first equipment allocation delivered to the Government. This assures the availability of equipment for training purposes.

Contractor conducted training, if required, will provide the Government personnel with the initial capability to operate, maintain, and train other personnel on DCOSS equipment. Location of training will be deteremined at a later date. Contractor conducted training requirements included in solicitation will assure that personnel are trained prior to acceptance of equipment and assuption of Government operation and maintenance responsibility.

7.3 Logistics

Logistics support for the DCOSS is discussed in the following sections.

7.3.1 General

Logistics support for the DCOSS equipment will be provided within the guidelines of existing DOD directives. The Integrated Logistics Support (ILS) Program shall be managed in accordance with policy contained in DOD Directive 5000.39 and guidance contained in AFR 400.46/AR 700-129/OPNAVINST Directive 4105.2 titled "Integrated Logistics Support Management of Multiservice Comm-Elec Systems and Equipment." All system control hardware will be procured under the direction and guidance of DCA.

7.3.2 Logistics Concept

The Air Force will serve as the life cycle manager for the SRCF hardware and software, DCOSS integration software, and SRCF communications hardware and software at the ACOC NCF/ALT NCF. DCA, as life cycle manager for the NCF/ALT NCF equipment and operating system software will be responsible for developing an Integrated Logistics Support Plan.

7.3.3 Supply Support

DOD Directive 5000.39, 4140.40 and DOD Instruction 7040.5 establish initial and follow-on support necessary to attain and sustain DCOSS availability. The Air Force will recommend and make available to other MILDEPs and DCA a Master Support List in accordance with AR 700-120, C-1, titled "Material Distribution Management," date August 26, 1974. The Air Force will coordinate and provide required documentation to other MILDEPs and DCA, adivising them of increased support requirements and the estimated date when needed.

7.3.4 Technical Data

Requirement for technical data will be identified by DCA and the Air Force. Unique technical data requirments will be funded by the requesting MILDEP.

7.3.5 Tools and Test Equipment

The Air Force will determine the quantity and location of tools and test equipment based on DCOSS equipment distribution. Items of common tools and test equipment already in the inventory will be acquired on as needed basis by each MILDEP. Unique tools or test equipment for each piece of DCOSS equipment will be screened by all participating MILDEPs and agencies. The Air Force, as the LMD, will acquire unique tools and test equipment for those elements of DCOSS for which it has support responsibility.

Calibration procedures for test equipment will be prepared in accordance with MIL-M-38793 and assigned multiservice numbers prior to publication and distribution.

7.3.6 Technical Assistance

The Air Force, as LMD, is responsible for providing technical assistance, when requested. This request will be through appropriate channels in accordance with DOD Directive 1130.2 and applicable MILDEP regulations will apply.

CHAPTER VIII

DCOSS SECURITY

8.0 General

DCS systems can be divided into two groups for security purposes - those that operate in a classified mode because they deal with classified information and those that operate in an unclassified mode because they deal with unclassified information but are considered sensitive from the standpoint of denial of communications service.

In addition to the requirements above, other sources of requirments are; security requirements and policies related to the DCA Worldwide On-Line System and security requirements and policies related to the operation of the DCOSS itself.

8.1 Basic DCOSS Security Statement

The DCOSS must be designed and implemented in such a manner that it can prevent the output of potentially compromising data, prevent denial of service, and insure data integrity. The following describes the specific DCOSS

security requirements as detailed in the Management Engineering Plan for the Integrated DCS System Control Program (OCONUS), June 20, 1986, Preliminary Draft.

8.1.1 Compromise - Security Level

The DCOSS shall enforce mandatory access of security levels (Unclassified through Secret) on all subjects against all objects.

8.1.2 Compromise - Category

The DCOSS shall enforce discretionary access to categories of data on a "need-to-know" basis by type of DCS subsystem (e.g., DPAS, DDN, DSN, and DSCS).

8.1.3 Denial of Service

The DCOSS shall ensure protection against denial of service so that no one user may so load DCOSS as to deny service to another user. Priorities will be under consideration.

8.1.4 Data Integrity

The DCOSS shall protect data from alteration except by authorized sources. Maintaining the distributed data base with integrity is the primary DCOSS requirement.

8.1.5 Accountability

The DCOSS shall provide accountability on an individual basis by the use of passwords and independent auditing.

8.1.6 Software Safeguards

The DCOSS shall be implemented in such a manner such that the software that provides the measures stated above is protected from unauthorized modifications or access.

8.2 DCOSS Security Criteria

8.2.1 Personnel

All personnel who operate, maintain, develop, or use

the DCOSS computer systems must be cleared to the SECRET level, and must be United States citizens (unless appropriate waiver of citizenship is granted by proper authority).

8.2.2 Administrative

A complete set of DCOSS security documentation must be prepared for each DCS site and for the overall system by approved security personnel.

8.2.3 Emanations Security (EMSEC)

All equipment will be installed in accordance with appropriate RED/BLACK security criteria. All DCOSS automatic data processing equipment must be evaluated and approved for use in a SECRET/NO-FORN physical environment.

8.2.4 Communications Security (COMSEC)

All communication lines external to building which carry RED data or are connected to the RED side of DCOSS

equipment must use NSA approved encryption/decryption equipment to secure the link.

8.2.5 Computer Security (COMPUSEC)

DCOSS will be developed in accordance with an approved DCOSS Security Concept based on applicable DOD Computer Security Center directives as outlined in CSC-STD 001-83 and substantiated in the DCOSS security architecture.

Software development for DCOSS will be accomplished by personnel possessing appropriate security classifications. Trusted processors and software will be acquired from vendors and packages listed in the DOD-CSC approved products list. Any interface by secure DCOSS hosts with non-secure, non-trusted, unclassified systems will only be accomplished through an intermediary processor which shall be CSC-DOD Trusted Systems Level B-2 or better. The flow of information shall be limited to rigidly templatable data.

8.2.6 DCOSS Operation and Use

Use of the DCOSS computer systems will be, from a security standpoint, separate from operation, system development, and data base updates. The access of each of these groups of personnel will be unique and there will no redundancy of functions. A possible exception is at the SRCF level where operational and user personnel may be the same person.

8.3 DCOSS Security Architecture

8.3.1 General

DCOSS security requirements will be based on the security needs of systems that utilize the DCOSS computers (e.g., DSN, WWOLS, DDN, etc). The DCOSS will include information classifications up to and including SECRET and will interface with unclassified systems at the SRCF level and with classified systems at the SRCF and NCF levels.

To meet security requirements the DCOSS will be designed to interface in a multilevel secure mode or be configured to eliminate the need for unclassified DCOSS interfaces. Methods of providing multilevel secure

operations are considered to be a risk, at present, to the timely development and implementation of the DCOSS.

The initial DCOSS secure operation is one in which unclassified DCOSS operations are physically separated from classified operations. This is accomplished by installing separate sets of processing equipment at the NCF for classifed and unclassified operations. The SRCF would operate in an unclassified mode. This approach requires parallel sets of equipment and impacts floor space, manning requirements, logistics, and the possible loss of some degree of timeliness related to integration between the classified and unclassified DCOSS operation. This method also reduces acquisition risks and design development.

In time, the above method could be replaced by a multilevel secure system which would require only one equipment architecture. In the multilevel secure mode of operation, the classified host computer equipment and software would be required to meet the C2 level security requirements, would be operated in a SECRET System-High mode, and would be protected by a multilevel "guard" unit or would be designed to operate as a multilevel secure system.

8.3.2 Phased DCOSS Security Development

The development of the DCOSS will follow a phased approach to meeting security requirements. The DCOSS will intially be implemented in an unclassified mode during Phase I. (See Figure 9-1). It will then transition to a separate classified and unclassified mode during Phase II. (See Figure 9-2). Ultimately, in Phase V (Figure 9-3), the DCOSS would operate in a multilevel host secure operation. It may be determined to move directly from Phase II to Phase IV. For a detailed description of each phase see the Managment Engineering Plan for the Integrated DCS System Control (OCONUS), June 20, 1986, Preliminary Draft, Section 13.

8.3.3 Equipment Installation

As appropriate, DCOSS equipment will be installed with full physical security arrangments, will be evaluated for TEMPEST concerns and will be manned by appropriately cleared personnel. External communications will be COMSEC protected and internal lines will use protected wire-line or equivalent.

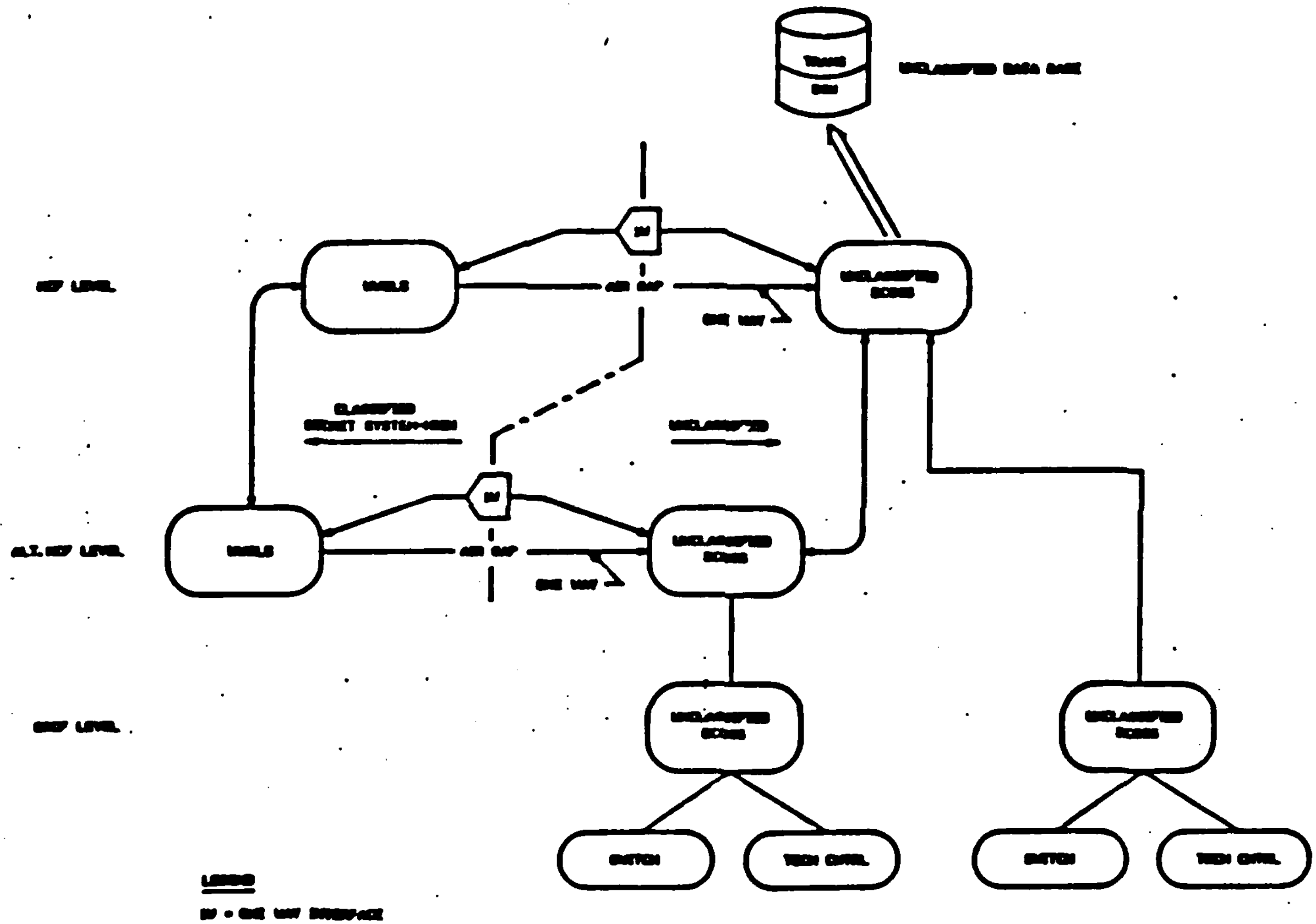

FIGURE 9-1

WWOLS/DCOSS SECURITY CONFIGURATION
PHASE I - UNCLASSIFIED

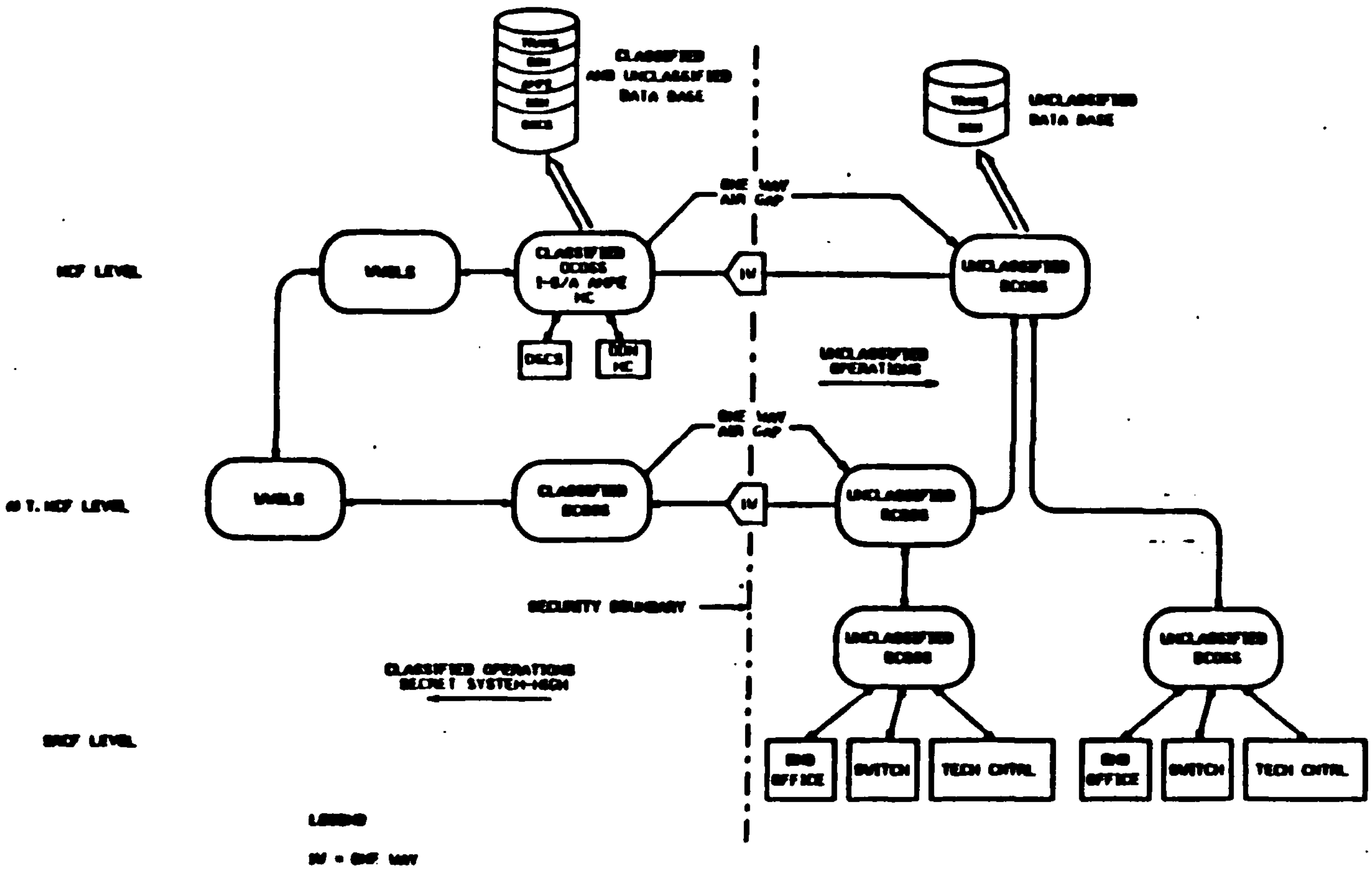

FIGURE 9-2

WWOLS/DCOSS SYSTEM CONFIGURATION
PHASE II - SEPARATE HOSTS

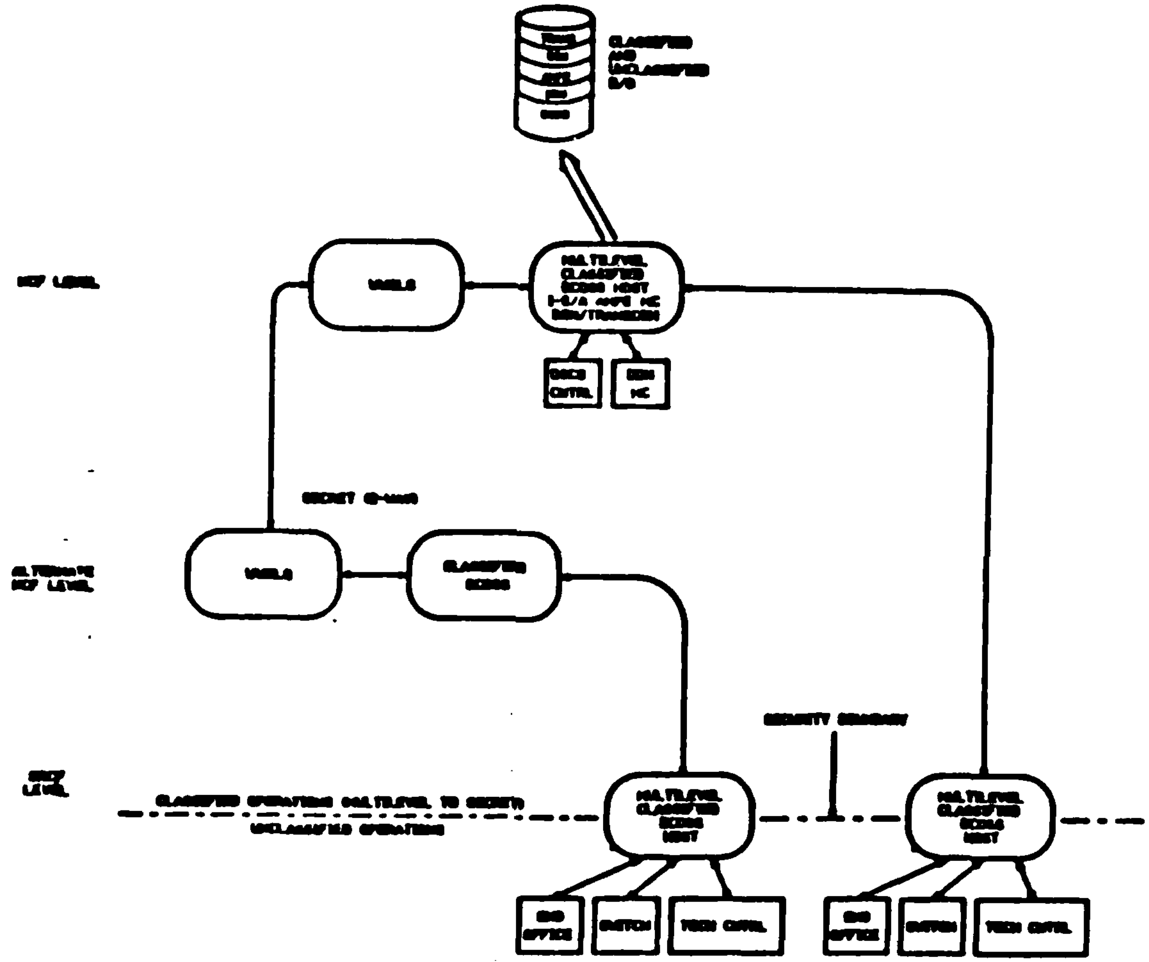

FIGURE 9-3

WWOLS/DCOSS SYSTEM SECURITY CONFIGURATION
PHASE V - MULTILEVEL HOST

CHAPTER IX

CONCLUSIONS

9.0 General

As a result of this project, we are recommending the following actions based on our analysis of the present DCS control system and planned implementation of the DCOSS. We feel that accomplishing these actions would reduce the risk and increase the potential for successful DCOSS implementation.

9.1 Interface Control Working Group (ICGW)

The DCOSS relies heavily on interfaces to other support systems (e.g. TRAMCON, DPAS, ACTS). Early identification of external and internal interface requirements and software compatibility is essential for interoperability between DCOSS elements and other operations support equipment. This task is difficult from a technical viewpoint due to the large scope of this effort and is compounded by the different agencies and MILDEPS at various levels of the DCS control heirarchy. That is, the DCOSS must interface with various vendor equipment, in-place and planned, presently under control of the individual military departments (Army, Navy, Air Force) and DCA.

9.2 Configuration Control Board (CCB)

To insure configuration changes are implemented across all participating government agencies, the CCB must have the authority and the means to effectively oversee all aspects of the system configuration. The CCB must be staffed with personnel knowledgable of system engineering and must asume the role of mediator for changes that effect different agencies. Additionally, the CCB must be informed by the proposing agency of any change that effects external agencies outside the authority of the proposing agency.

9.3 System Engineering

The scope and depth of the DCOSS dictates a need for a comprehensive system engineering plan. DCOSS is extremely dependent upon stright adherence to a system engineering authority. As such, DCA must assume the overall responsibility for ensuring that the DCOSS is designed and implemented in accordance with sound system engineering practices. The lack of overall system engineering has led to the present control system that is non-interoperable and heavily dependent upon operator intervention.

9.4 Risks

The nature of the DCOSS is such that technical risk increases at the lower levels of the DCS control heirarchy. DCOSS interfaces with new systems designed and developed by independent MILDEPS is a high risk area. Presently, it is unclear whether DCOSS interfaces have not been fully developed and identified with the appropriate interface control agencies.

In addition, software compatibility of the planned DCOSS integrated data base may prove costly and technically difficult. This poses a risk to pre-established system milestones. This is compounded by the fact that DCOSS is largely a software driven system.

To reduce the above risks, a comprehensive examination of interface requirements and software compatibility must be undertaken at the earliest possible date. The Computer Resources Working Group and the Interface Control Working Group must take aggresive action in to identify interface requirements and to develop a method of control to ensure the risks discussed above are minimized.

APPENDIX A

Acronyms

AANE	Allocation and Engineering
AAO	AUTOVON Assistance Operator
AARTS	Automated Audio Remote Test Set
ACAS	AUTOVON Centralized Alarm System
ADM	Advanced Development Model
ADP	Automated Data Processing
ADPE	Automated Data Processing Equipment
AFCL	Air Force Logistics Command
AI	Artificial Intelligence
AMA	Automatic Message Accounting
AMIE	AUTODIN Management Index System
AMPE	Automated Message Processing Exchange
ANCS	AUTOVON Network Control System
AO&M/NM	Administration, Operation and Maintenance/Network Management
ARC	Acquisition Review Committee
ASC	AUTODIN Switching Center
ATC	Automatic Traffic Control
AT&T	American Telephone and Telegraph
AUTODIN	Automatic Digital Network
AUTOSERVOCOM	Automatic Secure Voice Communications Network
AUTOVON	Automatic Voice Network
BAAARS	Base Access Area Automated Reporting System
BCTF	Base Central Test Facility
BISMC	Base Information Systems Management Center
CACEAS	Computer Assisted Circuit Engineering and Allocation System
CAF	Centralized Administration Facility
C^2	Command and Control
CCB	Configuration Control Board
CCC	Critical Control Circuits
CCITT	International Consultative Committee for Telegraph and Telephone
CCO	Circuit Control Office
CCS	Common Channel Signaling
CCSO	Command and Control System Organization (DCA G Codes)
CCSO	Communications Computer Support Office
CDE	Critical Design Element
CDRL	Contract Data Requirements List
CI	Configuration Item
CINC	Commander-in-Chief

CLIN	Control Line Item Number
CM	Configuration Management
CMF	Centralized Maintenance Facility
COM	Centralized Organizational Maintenance
COMSEC	Communications Security
COMSTAT	Communications Status (Report)
CONEX	Contingency and Exercise
COOP	Continuity of Operations Plan
CPCI	Computer Program Configuration Item
CPCP	Computer Program Change Proposal
CPCSB	Computer Program Configuration Sub-Board
CPIN	Computer Program Identification Number
CRISP	Computer Resources Integrated Support Plan
CRT	Cathode Ray Tube
CRWG	Computer Resources Working Group
CTL	Circuit, Trunk Link
DBA	Data Base Administrator
DBDG	Data Base Design Group
DBMS	Data Base Management System
DCA	Defense Communications Agency
DCAC	DCA Circular
DCA-EUR	Defense Communications Agency-Europe
DCAI	Defense Communications Agency Instruction
DCAOC	DCA Operations Center
DCA-PAC	Defense Communications Agency-Pacific
DCE	Defense Communications Equipment
DCEC	Defense Communications Engineering Center
DCOSS	Defense Communications Operations Support Center
DCS	Defense Communications System
DCSO	Defense Communicatons System Organization (DCA B Codes)
DCTN	Defense Commercial Telecommunications Network
DCUS	DCOSS Common User Subsystem
DDN	Defense Data Network
DEB	Derey Engineering Building
DEB	Digital European Backbone
DECCO	Defense Commercial Communications Office
DES	Data Encryption Standard (FIPS 46)
DOCC	DCA Operations Control Complex
DOCC	DCA Operations Center Complex
DOCS	DSCS Operations Control System
DOD	Department of Defense
DOSS	DSCS Operational Support System
DPAS	Digital Patch and Access System
DSA	Dial Service Assistance
DSCSOC	DSCS Operations Center

DSN	Defense Switched Network
DSNM	Defense Switched Network Mangement
DST	DCOSS Standard Terminal
DTN	Data Transmission Network
ECCB	Executive Configuration Control Board
ECP	Engineering Change Proposal
EDB	Exercise Data Base
EFAS	Enhanced Fault Alarm System
EMP	Electro-Magnetic Pulse
EO	End Office
ERP	European Restoral Plan
ERS	Emergency Relocation Site
ETR	Estimated Time to Repair
ETS	European Telephone System
FAS	Fault Alarm System
FCO	Facility Control Office
FMS	File Maintenance System
FOC	Final Operational Capability
FPP	Facility Project Plan
FRD	Functional Requirement Description
HAZCON	Hazardous Conditions
HEMP	High-altitude Electro-Magnetic Pulse
HMIWG	Human-Machine Interface Working Group
IAS	Integrated AUTODIN System
IAW	In Accordance With
ICD	Interface Control Document
ICWG	Interface Control Working Group
IDF	Intermediate Distribution Frame
IDSC	Integrated DCS System Control Program
ILS	Integrated Logisitcs Support
IMPRESS	Impact/Restoral System
INFORM	Information Retrieval System
IOC	Initial Operational Capability
IRU	Intellegent Remote Unit
I-S/A AMPE	Inter-Service/Agency Automated Message Processing Exchange
ISC	Intermediate Switching Center
ISF	Integrated Support Facility
IV&V	Independent Verification and Validation
JCS	Joint Chiefs of Staff
JDSSC	Joint Data System Support Center (DCA C Codes)
JMTSS	Joint Multichannel Trunking and Switching System
KDC	Key Distribution Center
KIP	Korean Improvement Program
KTU	Korean Telephone Upgrade
LAN	Local Area Network
LDP	Local Display Terminal
LMD	Lead Military Department
LOS	Line of Sight
LRU	Line Replaceable Unit

LSTDM	Low-Speed Time-Division Multiplexers
MC	Monitoring Center
MEC	Minimum Essential Circuit
MEP	Management Engineering Plan
MILDEP	Military Department
MILNET	Military Network
MINET	Movement Information Network
MPU	Micro-Processing Unit
MSRD	Master Software Requirement Document
MTC	Monitoring and Test Center
MUX	Multiplexer
NALLA	National Long Lines Agency
NATO	North Atlantic Treaty Organization
NCA	National Command Authority
NCF	Network Control Facility
NCS	National Communications System
NDCS	Network Data Control System
NIS	Network Information System
NM	Network Management
NROs	Network Routing Orders
NS&C	Network Surveillance and Control
OCONUS	Outside Continental United States
O&M	Operations and Management
OPR	Office of Primary Responsibility
OSI	Operational Subsystem Interface
OSRD	Operational Software Requirements Document
OT&E	Operational Test and Evaluation
OTS	Ohau Telephone System
PBX	Private Branch Exchange
PCA	Physical Configuration Audit
PD	Program Directive
PDR	Preliminary Design Review
PLCM	Product Level Configuration Management
PM	Preventive Maintenance
PMD	Program Management Directive
PMO	Program Management Office
PMP	Program Management Plan
PMRT	Program Management Responsibility Transfer
PROM	Programmable Read-Only Memory
PSI	Program and System Integration (DCA J Codes)
PFT	Patch and Test Facility
RAM	Ramdom Access Memory
RCF	Regional Control Facility
R&D	Research and Development
RDT	Remote Display Terminal
RDT&E	Research, Development, Test & Evaluation
RFO	Reason for Outage
RFW	Request for Waiver

RMR	Rapid Memory Reload
ROM	Read-Only Memory
SACDIN	Strategic Air Command Digital Network
SCF	Secure Conferencing Project
SCN	Specification Change Notice
SDS/PARS	Statistical Data System/Performance Analysis Reporting System
SEBD	System Engineering Data Base
SETA	System Engineering and Technical Assistance
SM/ALC	Sacremento Air Logistics Center
SMD	System Management Division
SMF	Software Maintenance Facility
SOR	Statement of Requirements
SPC	Stored Program Control
SRCF	Sub-Region Control Facility
SSF	System Support Facility
SVIP	Secure Voice Improvement Program
TCF	Technical Control Facility
TCO	*Telecommunications Certification Office*
TCOSS	Technical Control Operations Support System
TDCS	Traffic Data Collection System
TDOP	Total DCS Operations Plan
TEDS	Traffic Engineering Data System
TIP	Transmission Implementation Plan
TMT	TRAMCON Master Terminal
TNOP	Total Network Operations Plan
TSO	Telecommunications Service Order
TSR	Telecommunications Service Request
TTY	Teletype
USCINCEUR	U. S. Commander-in-Chief, Europe
VDU	Video Display Unit
VFCT	Voice Frequency Carrier Telegraph
VG	Voice Grade
WASP	WINTEX Automated Support Package
WHCA	*White House Communications Agency*
WIN	WWMCCS Intercomputer Network
WINCS	WIN Communications Subsystem
WWDSA	World Wide Digital System Architecture
WWMCCS	World Wide Military Command and Control System
WWOLS	World Wide On Line System

APPENDIX B

Definitions

Alternate Area Communications Operations Center (AACOC): Formerly the Regional Operations Center (ROC), the AACOC is designed to assume the responsibilities of the Area Communications Operations Center (ACOC) in the event the ACOC is temporarily disabled or destroyed. Two AACOCs are identified for the Pacific Theater and one for the Atlantic Theater of operations.

Area Communications Operations Center (ACOC): The ACOCs exercises day-to-day operational direction over the DCS control facilities, satellite facilities and other DCS operating elements, within the assigned theater of operations. The ACOC is part of the DCA Operations Control Complex (DOCC) and exercise responsibilities at level 2 of the DCS control hierarchy. (DCS Systems Control; Volume I Policy and Responsibilities; Draft February 6, 1986; DCA 310-70-1 PG VI). The two designated ACOCs are located at DCA-EUR in Vaihingen Germany and DCA-PAC in Oahu, Hawaii.

<u>Automatic Audio Remote Test Set (AARTS)</u>: Off-the-shelf test equipment that provides cooperative master-slave testing capabilities for Defense Communications System Technical Control Facilities. Current capabilities provide for analog circuit testing, but digital circuit testing will be added later. Early installations will be at Automatic Voice Network (AUTOVON) sites in Europe where access is available via the test line of the individual AUTOVON switches. This will provide a remote testing feature from a Sub-Region Control Facility (SRCF). The SRCF will look like a master station when commanding the remote AARTS. (DSN and DCS Terrestrial Transmission Operations Processes MTR 85W00237).

<u>Automatic Digital Network (AUTODIN)</u>: The present common user, secure, worldwide, digital communications network. The AUTODIN system consists of dedicated user circuits, automatic message switches, several large nodes for store-and-forward processing and switching, and voice-grade terrestrial links.

<u>Automatic Voice Network (AUTOVON)</u>: The present common-user, voice communications network that interfaces to Department of Defense and certain non-DOD subscribers. It is the principal long-haul voice communications network

within the Defense Communications System. It provides nonsecure, direct-distant dialing service worldwide through a system of government owned and leased automatic switching facilities.

Base Access Area Automated Reporting System (BAAARS): This test system will provide local Base Access Area communications facilities with an upgraded circuit test capability for fault bounding and isolation. The goal is to improve circuit efficiency through more effective use of maintenance resources and resulting reduction in fault isolation and restoral time. The BAAARS Test System is a user-friendly semi automated access and test device which uses remote line and alarm monitoring devices to aid in testing and fault isolating communications circuit problems within the base or post access area. The major elements of the BAAARS Test System are the controller terminal, switched access function, test function, remote line device and alarm monitoring device. The BAAARS will be interfaced with the Technical Control Operations Support System (TCOSS) via the ports provided for the controller terminals. Protocols and interfaces needed to pass the service-effecting alarms into the DCOSS system will be developed later. (DCOSS Functional Requirements of Overseas DSN AO & M/NM draft. June, 1985).

Defense Communications Agency (DCA): The joint service Department of Defense agency responsible for performing system engineering for the Defense Communications System (DCS). DCA ensures that the DCS is planned, improved, operated, maintained and managed effectively, efficiently and economically to meet telecommunications requirements of the National Command Authorities (NCA), DOD and other Government agencies. (DCS Systems Control; Volume 1: Policy and Responsibilities; Draft February 6, 1986, Page 1-1).

Defense Communications Agency (DCA): The Joint Service Department of Defense agency responsible for performing system engineering for the Defense Communications System (DCS). DCA ensures that the DCS is planned, improved, operated, maintained and managed effectively, efficiently and economically to meet the long-haul, point-to-point and switched network telecommunications requirements of the National Command Authorities (NCA), DoD and other Government agencies. (DCS Systems Control; Volume 1: Policy and Responsibilities; Draft February 6, 1986, Page 1-1).

Defense Communications Agency - Eur: The intermediate headquarters responsible for DCA operations in the European theater.

<u>Defense Communications Agency - Pac</u>: The intermediate headquarters responsible for DCA operation in the Pacific theater.

<u>Defense Communications Agency Operations Center (DCAOC)</u>: The field activity responsible for exercising day-to-day operational direction over the worldwide DCS operating elements. The DCAOC is part of the Defense Communications Agency Operations Control Complex (DOCC) and exercises control responsibilities at level 1 of the DCS control hierarchy. (DCS Systems Control; Volume I: Policy and Responsibilities; Draft, February 6, 1986; DCA 310-70-1, Page VIII).

<u>Defense Communications Operations Support System (DCOSS)</u>: The collection of automatic data processing based operations support systems providing support for administration, operations/maintenance and network management functions. The DCOSS consists of the following two major elements:

a. The Sub-Regional Control Facility (SRCF) - DCOSS. The particular ADP based operations support system located at the SRCF.

b. The Network Control Facility (NCF) - DCOSS. The ADP based operations support system located at the ACOC.

The DCOSS will be a computer based system dedicated to real-time control of (DCS) communications facilities and networks. (DSN and DCS Terrestrial Transmission Operations Processes MTR-85W00237, Page 6.1-1).

Defense Communications System (DCS): A composite of DOD owned and DOD telecommunications subsystems and networks composed of facilities, personnel and material managed by the DCA. It provides the long-haul, point-to-point, and switched network telecommunications needed to satisfy the requirements of the DOD and selected government agencies.

Defense Data Network (DDN): A high speed, packet-switched data transfer network which is authorized for use by DOD and other government agencies. All currently operational and planned automatic data processing systems and data networks of the Department of Defense that require long haul and area data communications support are required to become DDN subscribers.

Defense Data Network Monitoring Center (DDN-MC): Fourteen

monitoring centers (MCs), nine fixed and five mobile, are planned for DDN management. These centers will be interfaced with the DCOSS providing a direct input concerning status of the DDN. (DCOSS functional requirements for overseas DSN AO&M/NM Draft, June, 1985).

DCA Operations Control Complex (DOCC): The DOCC is the collection of DCS control centers that are assigned the responsibilities of Level 1 and 2 of the system control hierarchy. This includes the DCAOC, ACOCS, AACOCS and Associated Emergency Relocation Sites (ESRs). (DCS System Control Volume I, Policy and Responsibilities; Draft, February 6, 1986; DCA Circular 310-70-1, Page VI).

DSCS Operations Center (DSCSOC): A Level 2 DCA control center, the DSCSOC is responsible for controlling and managing DSCS earth terminals. DSCSOC controllers report and respond to direction from the ACOC and control DSCS satellite access by directing, monitoring and controlling earth terminal transmission parameters for each link. Additionally, DSCSOC controllers respond to the ACOC for implementation of restoral plans and for network problems affecting communications service.

Digital Patch and Access System (DPAS): The DPAS permits

rapid reconfiguration of 64Kbps channels on T-1 (1.544Mbps) links. As such the DPAS was developed to work with multi channel digital transmission systems. DPAS offers a method for managing circuits on T-1 lines and digital terminals by providing 64 Kbps electronic cross connections and test access for digital signals at 1.544 and 2.048 Mbps rates. The cross connect capability of DPAS will permit the assignment and redistribution of any 64 Kbps channel in a 1.544 or 2.048 Mbps digital group with any other 64 Kbps channel. The DPAS will enhance the flexibility of the DCS by reducing patch bay wiring on the main frame and reducing first level multipexor requirements. The objective is to provide the DCS with increased efficiency, faster system restoration, enhanced survivability and reduced operating and maintenance costs by using state-of-the-art digital control equipment. (DCOSS Functional Requirements for Overseas DSN AO & M/NM, Draft, June, 1985, Page F6).

Defense Switched Network (DSN): A common user switching and relay network which is part of the Defense Communications System. The Defense Switched Network consists of Multifunction Switches (MFSs), Stand Alone Switches (SASs) and End Offices (EOs).

Data Transmission Network - Low Speed Time Division Multiplex (DTN-LSTDM): A transmission network using low-speed time division multiplexor interfaced into the Digital European Backbone. The LSTDMs will take signals varying from baseband to 256 Kbps per channel and multiplex those signals into a T1 stream for transmission.

Emergency Relocation Site (ERS): A designated site for relocation of the Defense Communications Agency Operations Center (DCAOC) and the Area Communications Operations Centers (ACOCs) during a crisis situation.

Estimated Time to Repair (ETR): The estimated time required to bring an end item of equipment or a system back into operation.

Facility Control Office (FCO): The facility is responsible for day-to-day operations and maintenance of DCS facilities within a designated geographic area. Facility Control Offices are staffed and equipped by the MILDEPS (Army, Navy or Air Force).

Internetting: The capability for one control center or complex to use resources normally assigned to or under the organizational control of another complex.

Interoperability: The capability of a control center to perform a function, operation, or mission normally assigned to another control center.

Inter-Service/Agency Automated Message Processing Exchange (I-S/A AMPE): Automated Message Processing Equipment (AMPE) will be replacing the Automatic Digital Network (AUTODIN) to provide subscriber-to-subscriber formal message service, computer-to-computer communications, and command and control
record traffic using the Defense Data Network as the transmission backbone.

Patch and Test Facility (PTF): The patch and Test Facility is that part of the Defense Communication System which functions as a supporting activity under a Technical Control Facility. The Patch and Test Facility is at Level 5 in the DCS control hierarchy. Station controllers at this level are responsible for the following tasks:

a. Perform equipment and channel quality control.

b. Perform monitoring and testing.

c. Accomplish equipment substitution and restoral and channel substitution, restoral and rerouting.

d. Reroute, restore or coordinate restoration of disrupted circuits, groups, di-groups and super groups in accordance with published restoral plans or to the maximum extent possible.

e. Conduct fault isolation.

f. Support preventive and corrective maintenance.

g. Assess performance.

h. Notify users of service disruptions and conditions affecting restoration of service.

i. Report to and respond to direction from higher control levels.

(DCS Systems Control; Volume I, Policy and Responsibilities, Draft, February 6, 1986, DCA Circular 310-70-1, Page VIII).

Real Time: (1) Actual time during which a physical process transpires; (2) application in which response to input/output is fast enough to affect subsequent input, and (3) transmission which occurs sufficiently fast that it is

used in essentially the same manner as if it were instantaneous.

<u>Sub-Region Control Facility (SRCF)</u>: The Sub-Region Control Facility is responsible for the day-to-day operation and maintenance of Defense Communication facilities within its geographic area. These control facilities are staffed and equipped by the MILDEPS (Army, Navy or Air Force) and are assigned level three responsibilities of the Defense Communication System control hierarchy. (DCS Systems control; Volume 1, Policy and Responsibilities; Draft, February 6, 1986, DCA Circular 310-70-1, page IX).

<u>Technical Control Facility (TCF)</u>: The Technical Control Facility is the part of a Defense Communications System that functions as the interface between the transmission elements of the Defense Communications System and the users of the system. The Technical Control Facility is a Level 4 organization. (DCS Systems Control; Volume 1, Policy and Responsibilities; Draft, February 6, 1986; DCA Circular 310-70-1, Page IX).

<u>Technical Control Operations Support System (TCOSS)</u>: The Technical Control Operations Support System (TCOSS) is a collection of Operations Support Systems (OSSs) with

equipment residing at a Technical Control Facility. Some examples of TCOSS OSSs include the Automatic Audio remote Test Set (AARTS), the Base Access Area Automated Reporting System (BAAARs) and the Digital Patch and Access System (DPAS). (DSN and DCS Terrestrial Transmission Operations Process MTR-85W00237, September, 1985, Page 6.3-1).

<u>Total DCS Operations Plan (TDOP)</u>: Similar to the Bell System Total Network Operations plan (TNOP), the Total DCS Operations Plan develops procedures for present day Defense Communications System operations and then describes the same procedures as they are expected to be performed five years in the future. Procedures are organized into categories and subcategories. The four major categories are:

a. Engineering
b. System Management
c. Current Operations
d. General Management and Administration

<u>Transmission Monitoring and Control System (TRAMCON)</u>: An upgraded version of the Enhanced Fault Anaylsis System (EFAS) which will be used for monitoring and control of the Digital European Backbone. In the TRAMCON system operation, the monitoring process will start when a master

station sends a message to each of its remote units. The remote units respond with formatted messages that contain alarm conditions and parameter information about their respective communications sites. Another function the TRAMCON equipment performs is rotation of certain equipment at remote sites. The master unit performs a number of other functions that support the TRAMCON mission. These involve maintaining files on communication system configuration, information files on the status of communication system elements, and the necessary calibration and threshold tables for processing data from remote sites. (DSN and DCS Terrestrial Transmission Operators Process MTR-85W00237, September, 1985, Page 6.6-1).

Worldwide On Line System (WWOLS): The Worldwide On Line System is a distributed processing system made up of hardware and software resources at the Defense Communications Agency Operations Center (DCAOC), as well as the European and Pacific Area Communications Operations Centers and Defense Commercial Communications Office. The WWOLS is used for Defense Communications System Management at Level 1 and 2 of the DCS control hierarchy. WWOLS is an nonreal-time management system.

APPENDIX C

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APPENDIX D

DCOSS: EUROPEAN IMPLEMENTATION

FACILITY	LOCATION	INSTALLATION DATE
ACOC	VAIHINGEN, GE	FY 89
AACOC	UXBRIDGE, UK	FY 89
SRCF	TOREJON, SP	FY 89
SRCF	FRANKFURT, GE	FY 89
SRCF	ELMDAG, TK	FY 89
SRCF	THURSO, UK	FY 89
SRCF	NAPLES, IT	FY 90
SRCF	RAMSTEIN, GE	FY 90
SRCF	REESE AUGSBURG, GE	FY 90
SRCF	BERLIN, GE	FY 90
SRCF	SEMBACH, GE	FY 90
SRCF	PIRMASENS, GE	FY 91
SRCF	CHIEVRES, BE	FY 91
SRCF	AVIANO, IT	FY 91

SRCF	HELLINIKON, GR	FY 91
TCF	COLTANO, IT	FY 90
TCF	RHEIN-MAIN, GE	FY 90
TCF	HEIDELBERG, GE	FY 90

APPENDIX E

DCOSS: PACIFIC IMPLEMENTATION

FACILITY	LOCATION	INSTALLATION DATE
ACCC	OAHU, HI	To be determined
AACCC	CLARK AB, PI	FY 89
AACCC	YOKOTA AB, JA	FY 88
SRCF	YONGSAN AG, KOREA	FY 88
SRCF	FT BUCKNER, OK	FY 89
SRCF	TAEGU, KOREA	FY 89
SRCF	FINEGAYAN BAY, GUAM	OCT 86

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